Flathead County Community Wildfire Fuels Reduction / Mitigation Plan

March 2005

Prepared for

The Northwest Regional Resource Conservation and Development Area Incorporated and Flathead County

1121 East Broadway, Suite 113
Missoula, Montana 59802

Approval Page

The Flathead County Wildfire Fuels Reduction/Mitigation Plan has been developed as an appendix to the Flathead County Pre-Disaster Mitigation Plan.

APPROVED BY FLATHEAD COUNTY COMMISIONERS:

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Joe Brenneman	Date
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Robert Watne	Date
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Gary Hall	Date

Introduction

In December 2003, the United States Congress enacted the Healthy Forests Restoration Act (HFRA). This landmark legislation recognizes the role local communities can play in comprehensive forest planning in partnership with federal agencies responsible for public land management. The HFRA gives the US Forest Service (USFS) and the Bureau of Land Management (BLM) the statutory incentive to consider the priorities of local communities as they develop forest management and hazardous fuel reduction projects across the landscape. In order for local communities to participate fully in the HFRA process and implement meaningful projects on the ground, it is necessary for these communities to develop a Community Wildfire Protection Plan (CWPP).

The CWPP process, as outlined in the HFRA, provides flexibility in development of the plan itself. One of the most important factors is the assembly and active participation of various stakeholders concerned with a collaborative process wherein the needs and priorities of the local communities can be clearly articulated and mutually accepted. This community-based approach allows for local delineation of the wildland-urban interface (WUI), communities at-risk and the prioritization of hazardous fuel reduction projects.

The wildland-urban interface (WUI) is commonly described as the zone where structures and other human development meet and intermingle with undeveloped wildland or forest fuels. This WUI zone poses tremendous risks to life, property, and infrastructure in associated communities and is one of the most dangerous and complicated situations firefighters face.

For Flathead County, the wildland-urban interface zone is defined as that area in or immediately adjacent to wildland or forest fuels within 1.5 miles of residential structures, developments, or private properties suitable for development or for residential use. This zone may be adjusted based on site specific analysis and mapping using logical boundary locations such as geographic features or fuel breaks.

Individual features that will also be included as wildland-urban interface include:

- municipal or community watersheds,
- access roads needed for evacuations,
- important infrastructure including utility corridors, transportation corridors, and electronic sites necessary for emergency operations.

The boundary of the WUI may be adjusted over time as property status or development changes.

The HFRA emphasizes the need for federal land management agencies to work collaboratively with the communities in developing hazardous fuel reduction projects, and it places a priority on treatment areas identified in the CWPP. In addition, the

resultant CWPP provides local communities with an opportunity to influence where and how federal agencies implement fuel reduction projects on federal lands and how additional federal funds may be distributed for projects on adjacent non-federal lands.

This plan was developed using the eight-step process outlined in "Preparing a Community Wildfire Protection Plan – A Handbook for Wildland Urban Interface Communities"[1]. Additionally, this plan is intended to serve as an addendum to the Flathead County Pre-Disaster Mitigation Plan.

Plan Overview

Beginning in the summer of 2004, the Flathead Community Wildfire Protection Plan Steering Committee (Steering Committee), with funds from the Northwest Regional Resource Conservation Development Area Incorporated (RC&D) and Flathead County, embarked on the development of the "Flathead Community Wildfire Fuels Reduction/Mitigation Plan" (FCWFR). GCS Research, a Missoula-based geospatial information technology company, was contracted to assist the Steering Committee in the development of a comprehensive fuel reduction and mitigation plan. Emphasis was given to these goals:

1) community-based involvement in defining at-risk priority areas;
2) emphasis on involving local fire district chiefs responsible for community fire protection across the county;
3) collaboration and information exchange with responsible stakeholders interested in furthering the planning process (many of these parties are represented in the Steering Committee);
4) use GIS technology for data aggregation, analysis, and the public involvement process itself;
5) utilization of the best available GIS data for the study area;
6) utilization of existing homeowner fire protection programs such as FIREWISE;
7) the compilation of the planning results in a dynamic, digital document that would serve the community as it moves toward continued and meaningful fuel mitigation projects across Flathead County.

All GIS data associated with the priority areas within the County are hosted and maintained by Flathead County GIS department for delivery as an interactive, Web-based mapping application. The GIS data for this plan include the cadastral (land parcel) database for the study area. This allows for the calculation of at-risk land and structure values for individual or aggregated parcels within each of the identified priority areas identified in the plan. This will assist with FEMA (Federal Emergency Management Agency) fuel mitigation project funds necessary to reduce the risk of wildland fire to communities located in the study area.

[1] www.safnet.org/policyandpress/cwpp.cfm

Several citizen groups have already implemented community wildfire protection and fuel mitigation planning processes.[2] In some cases, on-the-ground hazardous fuel treatments projects have been implemented and/or are in the process of being implemented in zones assessed as at-risk priority areas. For these overlapping priority areas identified in this plan, special recognition should be given to the collaborative, public-private nature of the fuel treatment projects currently underway or in the planning process.

Homeowner awareness and the willingness to reduce risk across boundaries in meaningful, measurable, and closely monitored ways encapsulate the legislative intent and spirit of the HRFA, the National Fire Plan, and the 10-Year Comprehensive Strategy. Bottom-up, community-based forest management represents a viable means toward land stewardship and the ultimate goal of protecting lives and property within the growing wildland-urban interface.

In order to achieve a prime objective of the CWPP process, the plan's foundation rests upon the collaborative efforts of the Flathead County Steering Committee, which brings together diverse stakeholders from all levels of government and other interested parties.

These include:
Bill Swope (RC&D Forester)
Tom Reynolds (Flathead County GIS Manager)
Steve Bech (Safety Manager – Flathead Electric Cooperative)
Art Vail (Lands and Resource Manager, Plum Creek Timber Company)
Chuck Roady (F.H. Stoltze Land and Lumber Co.)
DC Haas (Fire Program Manager, Kalispell Unit, Montana Department of Natural Resources)
Carol Daly (President, Flathead Economic Policy Center)
Fred Vanhorn (Protection Specialist, Glacier National Park, National Park Service),
Allen Chrisman (Fire, Aviation, and Air Program Leader, Flathead National Forest, U.S. Forest Service),
Lynn Ogle (Flathead County Office of Emergency Services),
Gary Hall (Flathead County Commissioner),
Jack Kovacich (NorthWestern Energy Company)
Gary Mahugh (Fire Chief, Creston Rural Department)
Mr. Alan Marble (OES / Flathead County Fire Service Area)
Jeremy Pris (Fire Prevention Specialist, MT DNRC).

In addition to the solid collaborative starting-point for the plan as provided by the Steering Committee, one of the over-arching goals of the planning process was to engage local community members to assist in the prioritization process. To accomplish this, a

[2] The plans are included as appendices.

series of 10 meetings were conducted throughout the planning process. Valuable community-based input was captured and is presented in this report.[3]

Specifically, local fire chiefs from Flathead County fire districts were asked to review and comment upon the fire hazard priority areas within each of the districts. Each Fire District was presented with an informational mailing, which included a fire district map, colored markers, and materials outlining the planning process. Fire district personnel were asked to identify their areas of concern on the supplied map. Follow-up meetings, open to the public were scheduled and held with each fire district. This interaction was valuable both in terms of improving the quality of priority area assessment and building consensus in the county-wide planning process. Priority areas identified by Fire District Chiefs have been digitized into GIS format and are hosted with the Flathead County GIS Department interactive internet map server.

The resultant report, analyses, priority area assessments, and fuel mitigation overview represent a geospatially-enabled Flathead Community Wildfire Fuel Reduction and Mitigation Plan.

[3] Detailed community outreach information includes public notices, newspaper articles, radio, television coverage, personalized mailings, emails and telephone calls.

Vegetation Overview

The Flathead Community Wildfire Fuels Reduction/Mitigation Plan assesses conditions for Flathead County, Montana. The area of interest is approx. 5,098 square miles (3,262,720 acres) and contains multiple communities across a diverse landscape. Flathead County is one of the faster growing areas in Western Montana, the latest population estimates place the total population of Flathead County at approximately 79,485 people.[4]

Climatically, the average annual temperature is 42.6° F, the winter average temperature is 36° F, and the summer average is 78° F. The average annual rainfall is 16.51 inches, average annual snowfall is 55.2 inches (ranging from 16 – 100 inches per year), and the average annual growing season for agricultural productivity ranges between 104-129 days. Given the extreme topographical diversity, elevations range from 2,000 feet to as high as 10,000 feet within the Northern Rocky Mountain cordillera. This elevation gradient produces a range of vegetative communities indicative of the Northern Rocky Mountain Forest-Steppe Coniferous Forest – Alpine Meadow eco-region province as defined by Bailey.[5]

Indicative of the moisture, temperature, topographical variation, and continental location, the biogeography of the region is diverse and represents a clear gradient of vegetative communities ranging from warm-dry habitat types to cold-wet habitat types. The dominant forest types within the study area include:

- dry montane forests
- moist montane forests
- lower subalpine forests
- upper subalpine forests

[4] http://www.census.gov/popest/counties/tables/CO-EST2003-01-30.pdf

[5] http://www.fs.fed.us/colorimagemap/images/m333.html

Figure 1
LANDCOVER

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

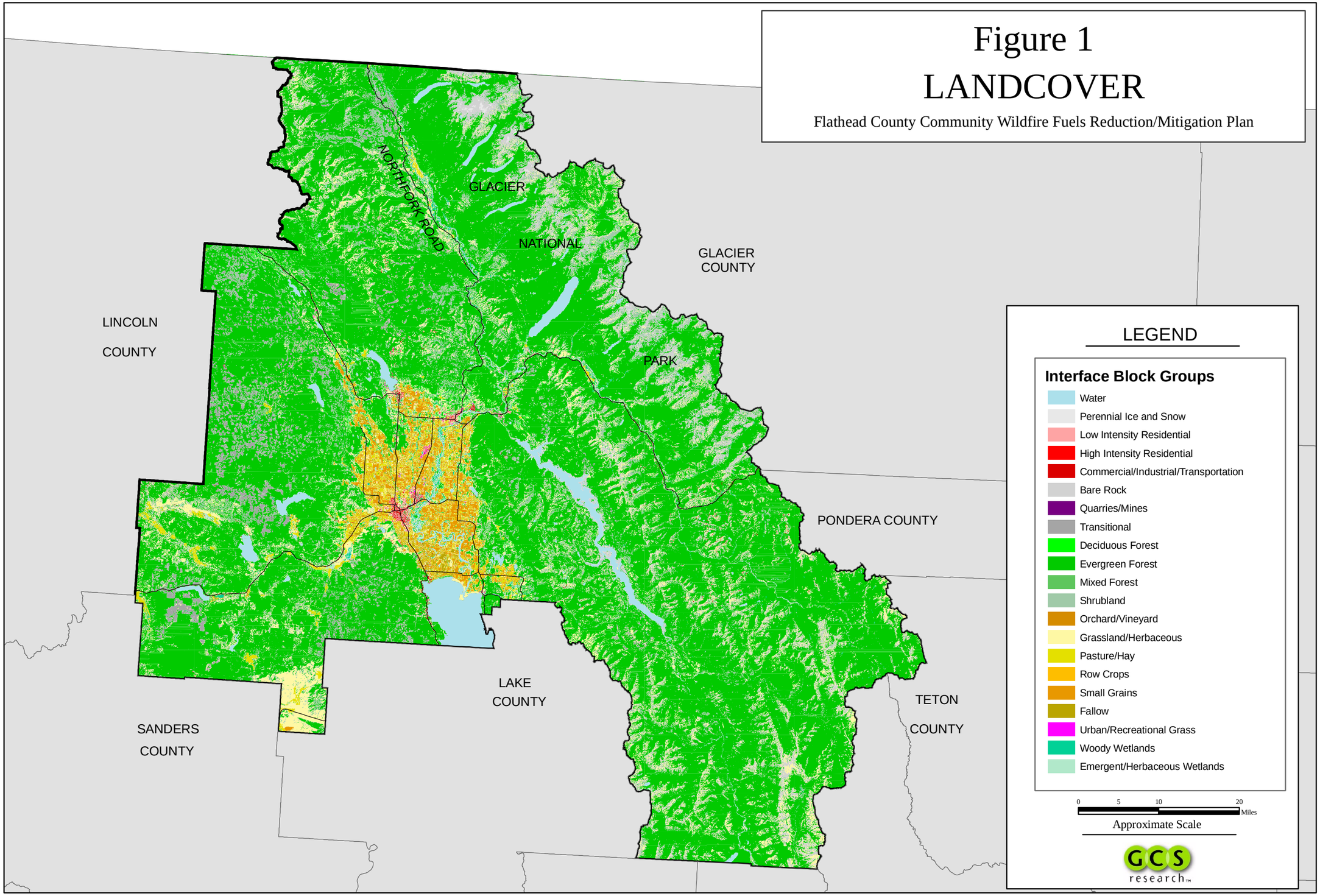

Figure 1: Flathead County study area showing landcover. From USGS National Landcover Dataset, 2000.

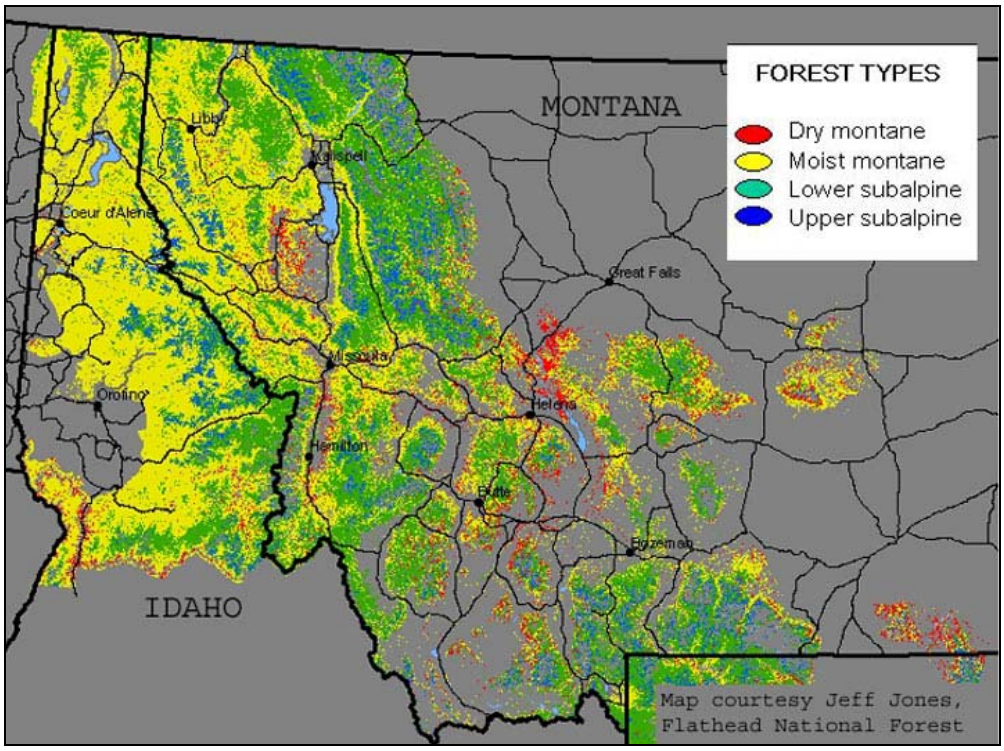

Figure 2: Forest Types across study area.

Each of these unique forest types represents complex successional pathways and disturbance regimes that define existing conditions across a landscape affected historically by long-term Native American inhabitation (ca. 12,000 B.P. – before present) and relatively recent Euro-American settlement (mid- to late-1800s to present).

Dry Montane Forests

Characterized by warm and dry conditions with less than 20 inches of rain per year, ponderosa pine, Douglas-fir, and western larch species dominate these portions of the study area. Depending on the actual rainfall totals and elevation, combinations of these forest types tend to be concentrated in the valley-bottoms and riparian corridors.

Dry montane forests throughout the study area typically experienced a frequent, low-intensity historical fire regime. Successful fire exclusion within many of these forest types has resulted in the accumulation of fuel, thereby altering fire behavior and effects.

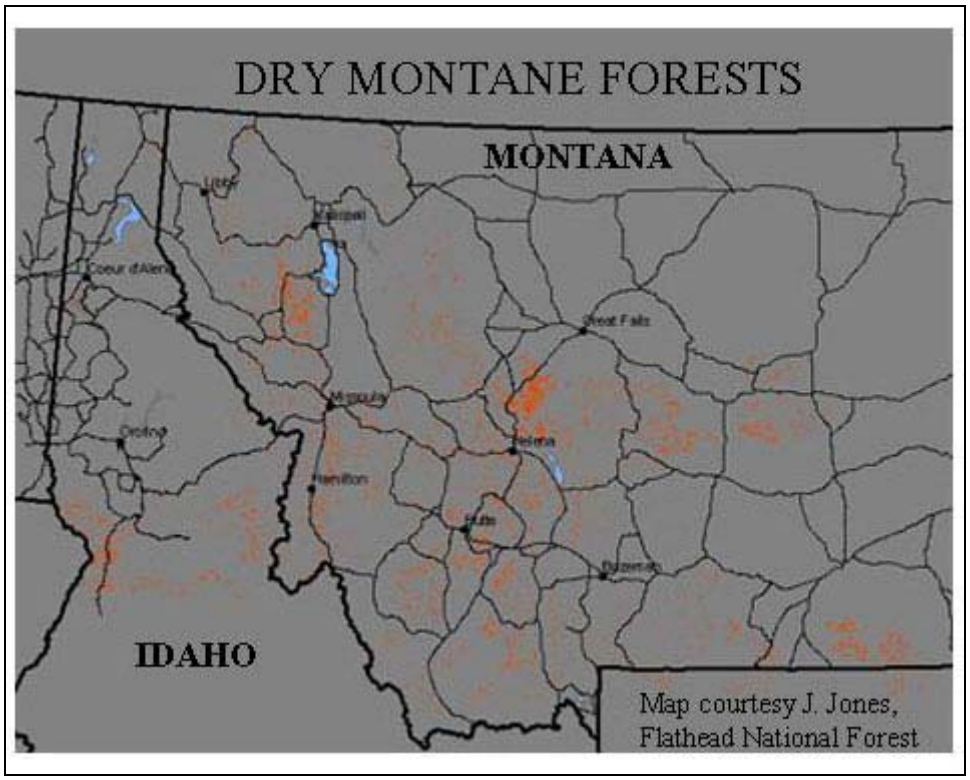

Figure 3: Dry Montane Forests across study area.

Moist Montane Forests

As one progresses upward along the elevation gradient within the study area, the mid-elevation forest types are moist, receiving at least 20 inches of mean annual precipitation per year. These wetter conditions allow drought tolerant such as ponderosa pine, Douglas-fir, and western larch to intermingle with less drought-tolerant species such as grand fir, western redcedar, western hemlock, Englemann spruce, and subapline fir. These "mixed conifer" forests co-occur in varying combinations throughout the study areas and can be found generally in the 3000-7000 foot elevation bands. As is the case with each of the forest types, depending on actual precipitation, temperature, and soil conditions as well as disturbance regimes, varying concentrations and assemblages occur through the study area.[6] Compared with the dry montane forest types, moist montane forests tend to burn less frequently (longer fire return interval), and with a higher severity. As such, they are typically characterized as being moderate-frequency and

[6] Arno, S. F. 1979. Forest regions of Montana. USDA Forest Service, Intermountain Forest and Range Experiment Station, Research Paper INT-218; Cooper, S. V., K. E. Neiman, R. Steele, and D. W. Roberts. 1991 (rev.). Forest habitat types of northern Idaho: a second approximation. USDA Forest Service, Intermountain Forest and Range Experiment Station, General Technical Report, INT-236; Peet, R. K. 1988. Forests of the Rocky Mountains. Pp. 63-102 in M. G. Barbour and W. D. Billings, editors, North American Terrestrial Vegetation. Cambridge University Press, New York, New York, USA.

mixed-severity, resulting in a patchy mosaic indicative of much of the forest communities present across the study area.

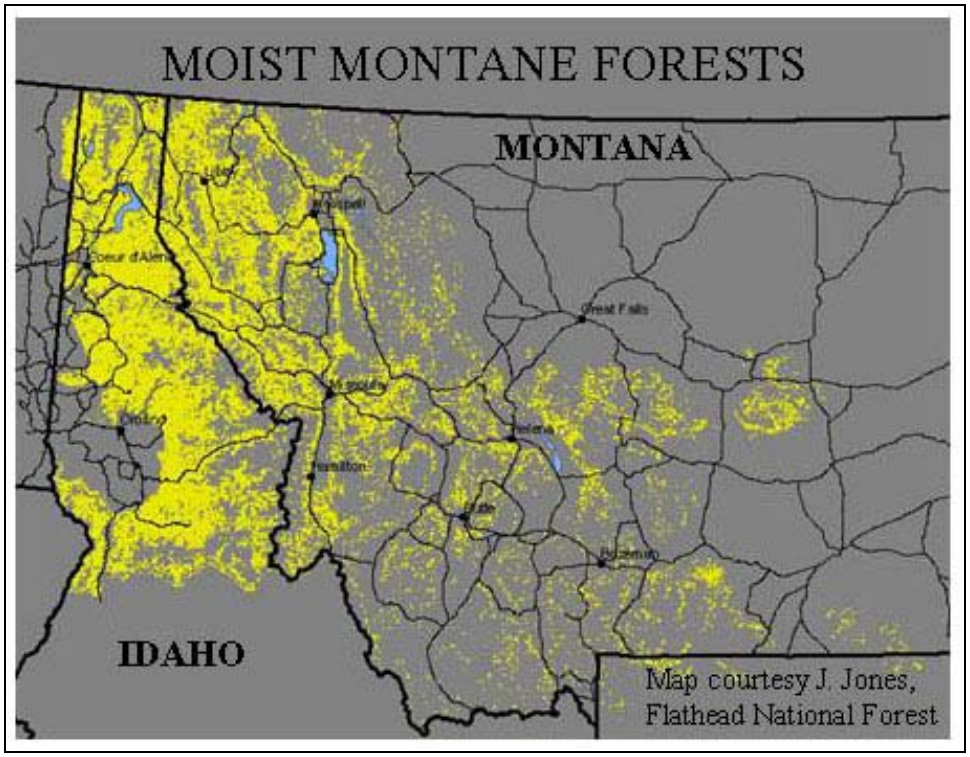

Figure 4: Moist Montane Forests across study area.

Lower Subalpine Forests

The third forest type found within the study area is lower subalpine forests located in generally cool, moist sites between 5,000 and 7,000 feet in elevation. Average July temperatures in this forest type fall between 60° and 64° F, and mean annual precipitation ranges from 20 to 50 inches. Much of the annual precipitation occurs in the form of snow. Englemann spruce and subalpine fire dominate many of the stands found in this forest type. Mountain hemlock and lodgepole pine stands are also present. In particular, continuous, pure stands of lodgepole pine occur in the study area in areas that are relatively cold and dry and wherein lodgepole pine is able to successfully out-compete other conifers based upon its particular evolutionary relationship with an infrequent, high-severity stand replacement fire regime.

Depending upon temperature and precipitation microclimates within the lower subalpine zone, Douglas-fir, western larch, western white pine, and whitebark pine are also found in the study area.[7] Lower subalpine forests are characterized as experiencing infrequent, mixed-severity to severe fire regimes.

One exception to the generalization is the pattern exhibited within certain lodgepole pine stands. Given the relatively dryness of lodgepole communities within the lower subalpine forests, it is possible to have more frequent understory burns occur. Moreover, given periodic disease and insect infestation disturbance cycles (e.g., mountain pine beetle), crown fire behavior is supported and often experienced within lodgepole pine dominated stands. Correlations between historical fire regime variation within lodgepole pine stands and insect infestation represent a unique example of the complexity associated with understanding the variety of permutations possible between forest type and historical fire regime condition class generalization within the study area.

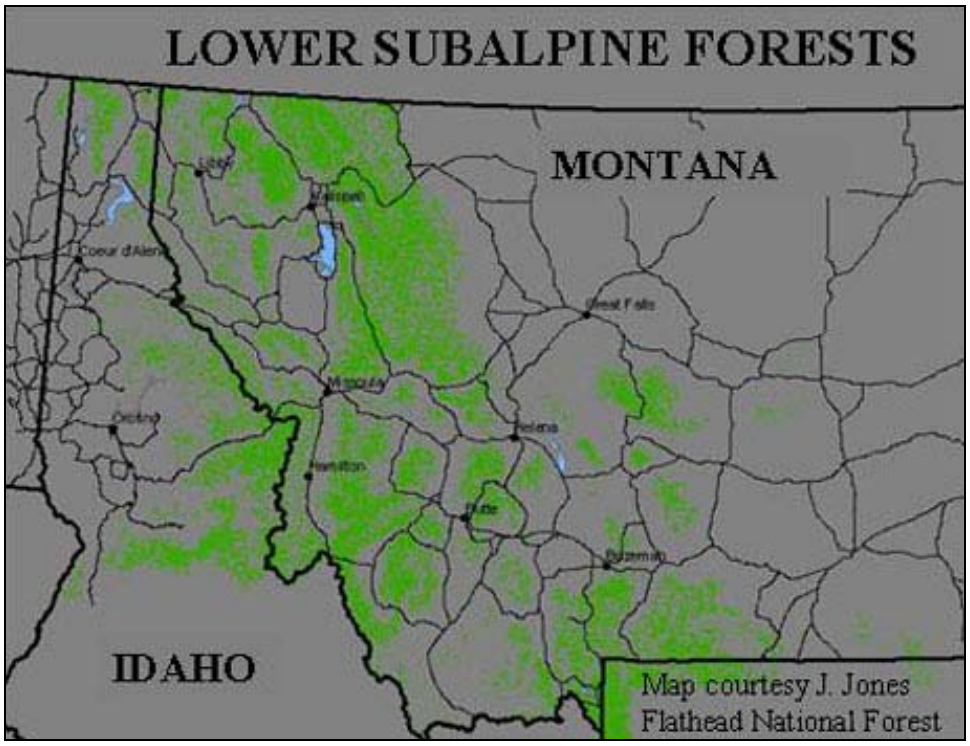

Figure 5: Lower Subalpine Forests across study area

[7] Arno, S. F. 1979. Forest regions of Montana. USDA Forest Service, Intermountain Forest and Range Experiment Station, Research Paper INT-218; Cooper, S. V., K. E. Neiman, R. Steele, and D. W. Roberts. 1991 (rev.). Forest habitat types of northern Idaho: a second approximation. USDA Forest Service, Intermountain Forest and Range Experiment Station, General Technical Report, INT-236; Pfister, R. D., B. L. Kovalchik, S. F. Arno, and R. C. Presby. 1977 (rev.). Forest habitat types of Montana. USDA Forest Service, Intermountain Forest and Range Experiment Station, Research Paper, INT-34.

Upper Subalpine Forests

The upper subalpine forests occur in the higher elevations of the study area, generally above 7,000 feet and extending to the upper timberline. Average July temperatures are cool and range from 50 to 60 F, and the mean annual precipitation ranges from 25 to 60 inches. The majority of the precipitation is received in the form of snow. Given the relatively harsh conditions present at these elevations, and the limited growing seasons, certain species such as ponderosa pine, Douglas-fir, western larch, and western white pine are generally not found. The most cold-tolerant species such as subalpine fir, Englemann spruce, alpine larch, lodgepole pine, and whitebark pine persist in the upper subalpine zone. In general, and while there is notably an ecologically important variation around the mean, upper subalpine forest fires tend to occur infrequently with mixed-severity.[8]

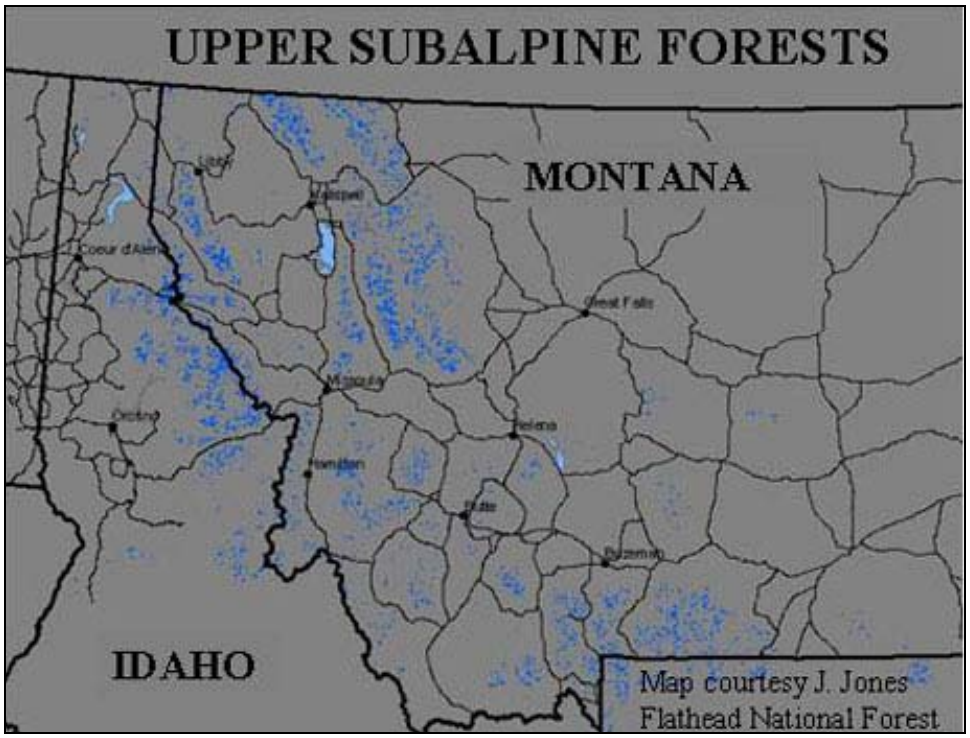

Figure 6: Upper Subalpine Forests across study area.

[8] Cooper, S. V., K. E. Neiman, R. Steele, and D. W. Roberts. 1991 (rev.). Forest habitat types of northern Idaho: a second approximation. USDA Forest Service, Intermountain Forest and Range Experiment Station, General Technical Report, INT-236; Pfister, R. D., B. L. Kovalchik, S. F. Arno, and R. C. Presby. 1977 (rev.). Forest habitat types of Montana. USDA Forest Service, Intermountain Forest and Range Experiment Station, Research Paper, INT-34.

Historical Fire Regimes and Fire Condition Class

Within the study area, a basic understanding of fire regime by forest type is extremely significant because fire represented the dominant disturbance force affecting the structure and function of these forest communities.[9]

Fire history analysis between 1940 and 2003, as depicted in Figure 8, shows the extent of fires within the study area. This analysis is by no means complete or exhaustive, and does not take into account pre-1940 wildland fires that affected the area and contributed to the existing forest mosaic.[10]

The complex, combined legacy of alterations in fire regimes, changes in land use practices due to increased resource utilization and patterns of inhabitation, and federal land management practices (fire suppression) serve as the underlying necessity for the Flathead Community Wildfire Fuel Reduction/Mitigation Plan.

The landscape pattern of fire occurrence within a given forest type can be described as a fire regime. A fire regime consists of spatial (place) and temporal (time) factors. Within the Northern Rockies ecoregion and the encapsulated Flathead County study area, historical fire regimes are characterized by the frequency and severity of fires occurring within a forest type for a given geographical area and historical period. Frequency addresses the average return interval of a fire event for a particular geographical area. Severity, while defined in various ways, generally can be considered a measure of the effects of a fire event upon the both overstory and understory components of the forest type.[11]

Scientific research into fire history, short-term climatic variability (recent Holocene), and changes in successional pathways for these forest types provide a detailed assessment of historical fire regimes over the last four to five hundred year period.

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[9] Fischer, W. C., and A. F. Bradley. 1987. Fire Ecology of western Montana forest habitat types. USDA Forest Service, Intermountain Forest and Range Research Station, General Technical Report, INT-223.

[10] See http://www.fs.fed.us/r1/cohesive_strategy/datafr.htm. As stated in the metadata document for the fire history data: "Abstract - This layer was initiated to provide the National Fire Plan, Cohesive Strategy Team, with the best, currently available data on fire history in the Region One area. A regional fire history grid did exist, but newer data sets were available for 8 of the 13 forests. The previous data, and existing data for the remaining forests was less than complete or non-existent. Data was collected from many sources and combined into a common format across the region. Fire data was obtained from individual forests, a regional fire grid, historical records, and the 2000 and 2001 fire perimeters obtained from the R1 website. The information was collected and put into a polygon coverage to facilitate conversion to ArcGIS in the near future. An item for each of 7 decades, 40s, 50s, 60s, 70s, 80s, 90s, and 00, was populated with the year of each fire. This also allowed for multiple year fires. This coverage has some information lacking and it would be good to add better data as it becomes available to make the coverage more useful and consistent."

[11] Agee, J. K. 1990. The historic role of fire in Pacific Northwest forests. Pp. 25-38 in J. D. Walstad, S. R. Radosevich, and D. V. Sandberg, editors, Natural and prescribed fire in Pacific Northwest forests. Oregon State University Press, Corvallis, Oregon; Brown, J. K. 2000. Introduction and fire regimes. Pp. 1-7 in Wildland fire in ecosystems: effect of fire on flora. USDA Forest Service Rocky Mountain Research Station, General Technical Report RMRS-GTR-42-VOL-2.

Figure 7
HISTORIC FIRE REGIME

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

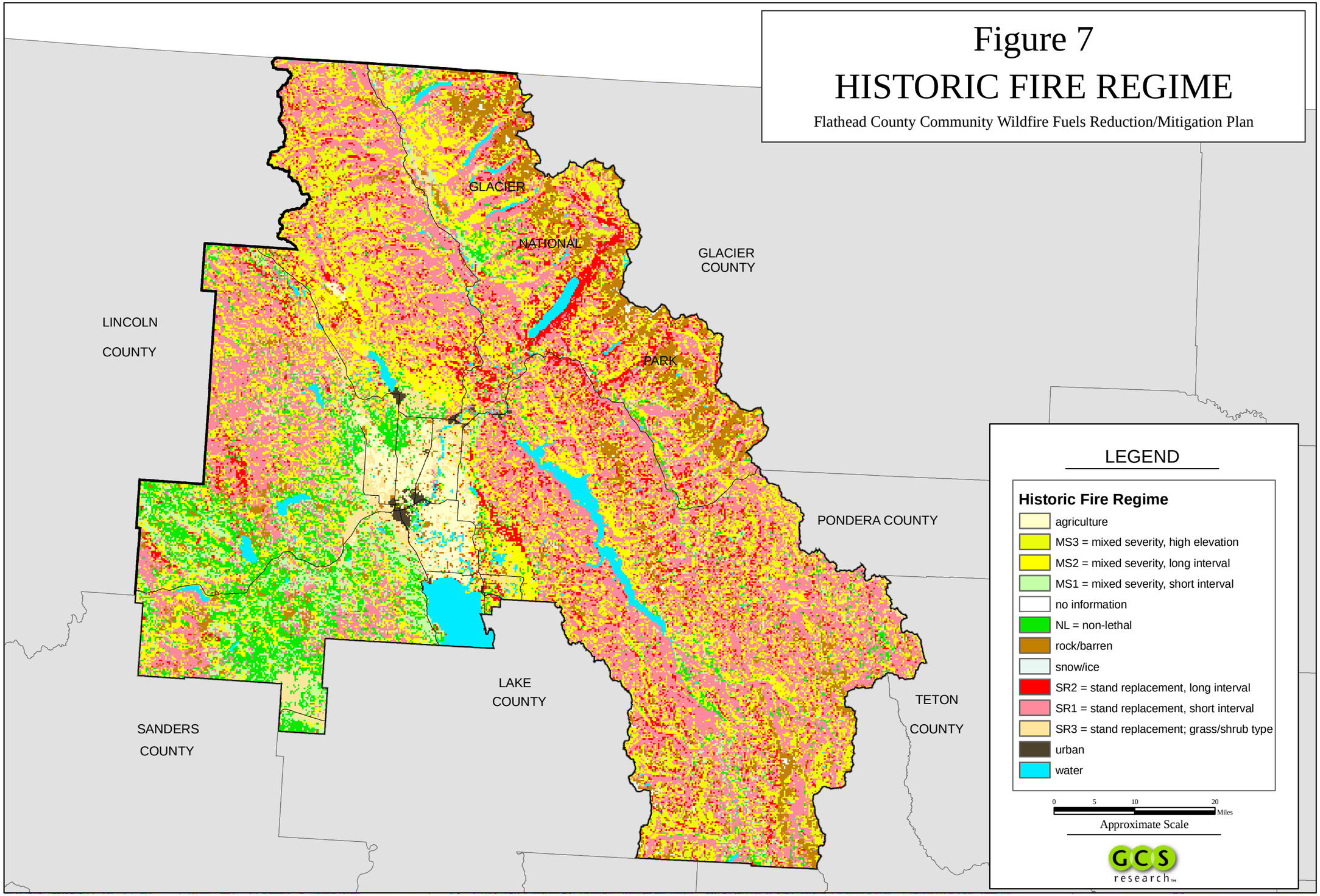

Figure 7: Historic Fire Regimes of Flathead County Study Area. USFS data.

Additional scientific examinations combining fire scar analysis, investigations of fossil pollen and charcoal (and palaeoclimatic variation) provide a longer-term understanding of the role fire has played in shaping modern forest communities. In sum, historical fire regimes provide a crucial baseline for assessing the ecological patterns and processes associated with fire as a dominate disturbance factor in the structure and function of modern forest types currently found within the study area.[12]

As a result of modern Euro-American inhabitation patterns and a variety of land-use practices in the Northern Rockies beginning in the mid-19th century, forest types and associated historical fire regimes have been increasingly altered. Against these relatively modern anthropogenic effects, it is important to note that long-term Native American inhabitation, associated land-use patterns, and resource utilization also impacted the nature of historical fire regimes within the Northern Rockies ecoregion for at least the last 12,000 years. However, significant alteration in historical fire regimes of the Northern Rockies began as a result of the legacy of the 1910 fire season.

The aforementioned forest types (dry montane, moist montane forests, lower subalpine and upper subalpine forests) found with the study area can be characterized as having experienced one or a combination of the following historical fire regimes:

- frequent, low-severity;
- moderate-frequency, mixed-severity;
- infrequent, mixed-severity;
- infrequent, high-severity fires.

Indicative of dry ponderosa pine, Douglas fir, and western larch stands, frequent, low-severity fires are those that recur, on average, approximately every 25-30 years or less. The fire return interval may actually be as low as 5 years. The fire effects are minimal and less than 80% of the overstory trees, i.e., Ponderosa pine, are killed. The fire generally carries through the understory vegetation and duff and litter concentrations deposited by the forest canopy.

As the dominant historical fire regimes within the study area, moderate-frequency, mixed-severity and infrequent, mixed-severity fire regimes have combined to produce the dominant forest patterns across the landscape study area. Often, these patterns are described as a patchy mosaic. Moderate-frequency, mixed-severity fire regimes are characterized by fires with an average fire-free interval ranging from approximately 30 to 100 years. Infrequent, mixed-severity fire regimes are characterized by fires that recur at average intervals greater than 100 years. Mixed-severity fire regimes often produce a mixture of lethal results for dominate overstory vegetation depending upon the individual species within the forest type. Severity is an assessment

[12] Arno, S. F. 1976. The historical role of fire in the Bitterroot National Forest. USDA Forest Service, Intermountain Forest and Range Experiment Station, Research Paper INT-187; Heyerdahl, E.K, L. B. Brubaker, and J. K. Agee. 2002. Annual and decadal climate forcing on historical fire regimes in the interior Pacific Northwest, USA. The Holocene 12:597-604.

of the immediate effects of the fire upon vegetation, litter or soils. Thus, it is an assessment of fire effects on the forest community.[13]

Infrequent, high-severity fires, which do occur within the study area with increasing frequency, tend to occur at intervals ranging from 100 to 400 years. The conditions for these types of fires are the result of topographic features, extreme meteorological conditions, prolonged fuel accumulations, forest type conditions, and other factors that are the focus of intense scientific analysis given the hazards they pose to human communities within the WUI. One of the distinguishing characteristics of an infrequent, high-severity fire is that few overstory trees survive (lethality >80%).

These types of fire are generally described as "stand-replacement" in nature as they result in a recycling of primary successional processes and complete forest regeneration. These fires also exhibit crown-fire behavior, can consume vast amounts of acreage, and result in extensive alteration of the forest community. Depending upon the circumstances associated with these types of fires, slow-moving fires that are transported primarily through the understory fuel can also be described as being infrequent and high-severity. Again, this is based upon the fact that slow-moving fires, while technically less intense than a crown fire, can produce a great deal of heat over an extended period of time resulting in high-percentage mortality to the overstory vegetation, thereby resulting in stand-replacement effects. [14]

It is important to note that based upon an understanding of historical fire regimes within the study area, large-scale, severe stand-replacement fires of varying frequency occur within the study area.

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[13] Fire severity and fire intensity are commonly confused. They are distinct assessment of fire effects and behavior as detailed in a fire regime description. "Fire intensity refers to the rate at which a fire produces heat at the flaming front and should be expressed in terms of temperature or heat yield. Fire severity, on the other hand, describes the immediate effects of fire on vegetation, litter, or soils." http://www.northernrockiesfire.org/history/fireis.htm; See also, Robichaud, P. R., J. L. Beyers, and D. G. Neary. 2000. Evaluating the effectiveness of postfire rehabilitation treatments. USDA Forest Service, Rocky Mountain Research Station, General Technical Report, RMRS-GTR-63. Available online at http://www.fs.fed.us/rm/pubs/rmrs_gtr63.pdf.

[14] Brown, J. K. 1995. Fire regimes and their relevance to ecosystem management. Pp. 171-178 in Proceedings of Society of American Foresters National Convention; 1994 Sept. 18-22; Anchorage, Alaska. Society of American Foresters, Bethesda, Maryland, USA; Ibid. 2000. Introduction and fire regimes. Pp. 1-7 in Wildland fire in ecosystems: effect of fire on flora. USDA Forest Service Rocky Mountain Research Station, General Technical Report RMRS-GTR-42-VOL-2.

Figure 8
FIRE HISTORY

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

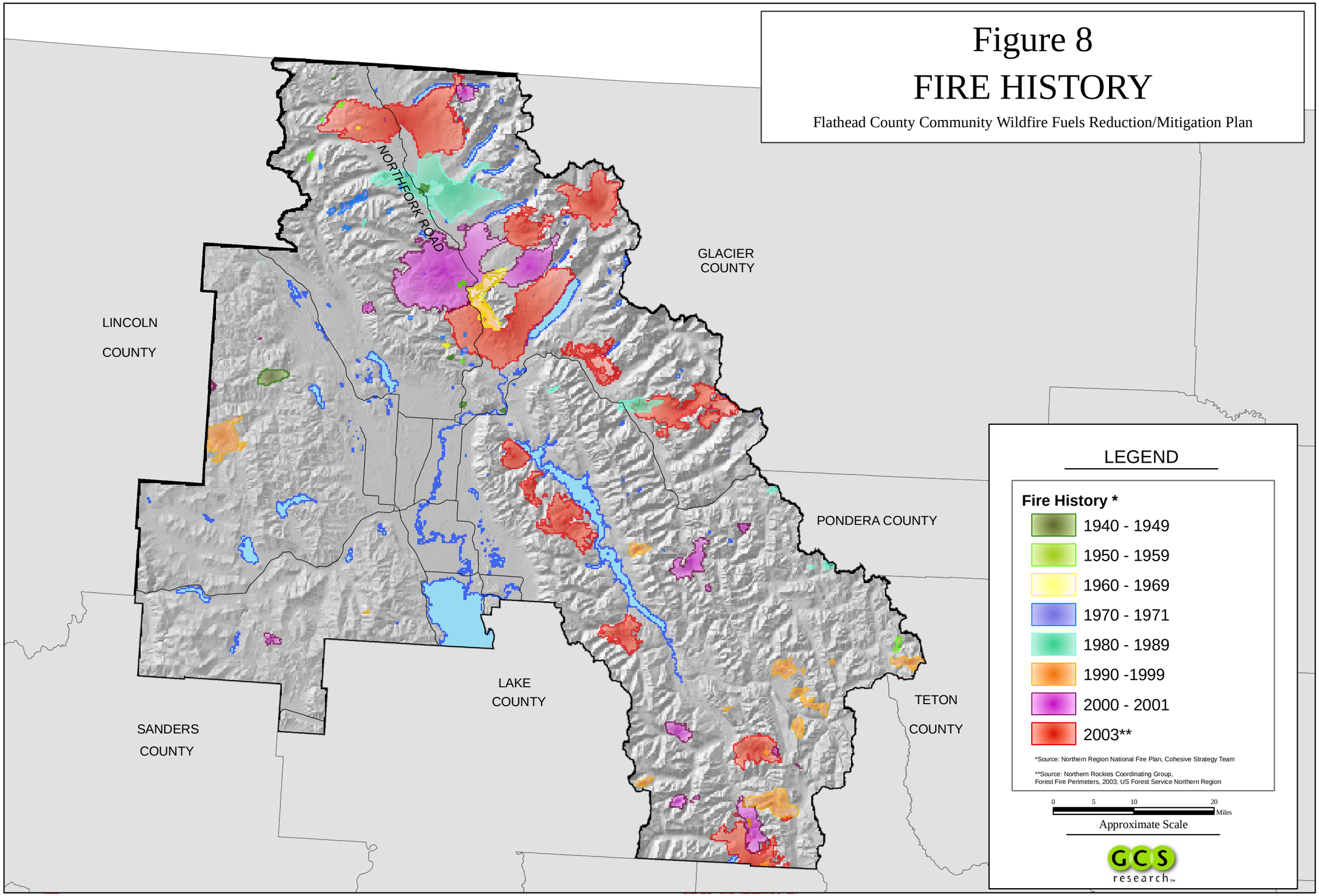

Figure 8: Fire History - Flathead County study area. USFS data.

Fire Regime Condition Class

Change in fire regimes represents a comparison of the historical and contemporary disturbance mechanisms. Generally, these comparisons show change in the patterns of fire frequency and effects within particular forest types. Prior to 1910, and the catastrophic fires experienced throughout large portions of the Northern Rockies during this year, each of the previously described forest types experienced a particular historical fire regime or mixture of fire regimes. Reacting to the devastating impacts of the 1910 fires upon human communities, federal land policy regarding wildland fire shifted toward a program of complete suppression.

As this policy became substantiated across the Northern Rockies and expressed on the ground within the Flathead County study area, significant alterations in historical fire regimes also occurred. Simultaneously, forest resource utilization increased dramatically, especially following the end of World War II and the massive growth in wood product utilization experienced during the 1950s.

In sum, the 20th century period ushered in a series of overlapping, compounding alterations of historical fire regimes within forest communities within the study area. For certain locations and time periods, these changes have been more dramatic and the deviation from the historical baseline more extreme. In other areas, ecological processes, while constantly changing independent of readily identifiable alteration, remain consistent with historical norms.

While it is impossible to fully detail how these socio-economic and ecological processes interacted, human communities within the study area exist within an altered landscape comprised of a matrix of managed lands. Ecological processes within the defined forest types continue and a variety of fire patterns continues to impact local communities.

One contemporary measure of the degree of change from historical fire regime is the fire regime condition class (FRCC). A fire regime condition class is a classification of the amount of the departure from the historical fire regime (natural regime).

Currently, there are three primary FRCC classes: low, medium, and high.[15] A "low" classification is defined as within the historical range of variability as denoted in the particular historical fire regime. A "medium" classification denotes moderate departure from historical range of variability and forest conditions gravitating outside historical ranges of variability. A "high" classification denotes significant departure from the historical range of variability with significant risk of severe impacts on forest communities.

The five natural (historical) fire regimes are classified based on average number of years between fires (fire frequency) combined with the severity (amount of replacement) of the fire on the dominant overstory vegetation. These five regimes include:

I – 0-35 year frequency and low (surface fires most common) to mixed severity (less than 75% of the dominant overstory vegetation replaced);
II – 0-35 year frequency and high (stand replacement) severity (greater than 75% of the dominant overstory vegetation replaced);
III – 35-100+ year frequency and mixed severity (less than 75% of the dominant overstory vegetation replaced);
IV – 35-100+ year frequency and high (stand replacement) severity (greater than 75% of the dominant overstory vegetation replaced);
V – 200+ year frequency and high (stand replacement) severity.[16]

GIS data from the U.S. Forest Service Region One Cohesive Strategy Team was used to produce a detailed cartographic overview of the FRCC within the study area shown in Figure 10. An excerpt from the metadata is provided below:

Fire Regime Condition Class Description Potential Risks[17]

Condition Class 1:

- *"Fire regimes are within their historical range and the risk of losing key ecosystem components as a result of wildfire is low. Vegetation attributes (species composition and structure) are intact and functioning within an historical range. Fire effects would be similar to those expected during historical times."*

Condition Class 2:

- *"Fire regimes have been moderately altered from their historical range. The risk of losing key ecosystem components as a result of wildfire is moderate. Fire frequencies have changed by one or more fire-return intervals (either increased*

[15] Please see: http://www.frcc.gov/docs/FrccDefinitionsFinal.pdf

[16] Ibid

[17] Ibid; See also: http://www.fs.fed.us/r1/cohesive_strategy/data/abstract/frc.htm

or decreased). Vegetation attributes have been moderately altered from their historical range. Consequently, wildfires would likely be larger, more intense, more severe, and have altered burn patterns than that expected during historical times."

Condition Class 3:

- *"Fire regimes have changed substantially from their historical range. The risk of losing key ecosystem components is high. Fire frequencies have changed by two or more fire-return intervals. Vegetation attributes have been significantly altered from their historical range. Consequently, wildfires would likely be larger, more intense, more severe, and have altered burn patterns than that expected during historical times."*

Figure 9
FIRE REGIME CONDITION CLASS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

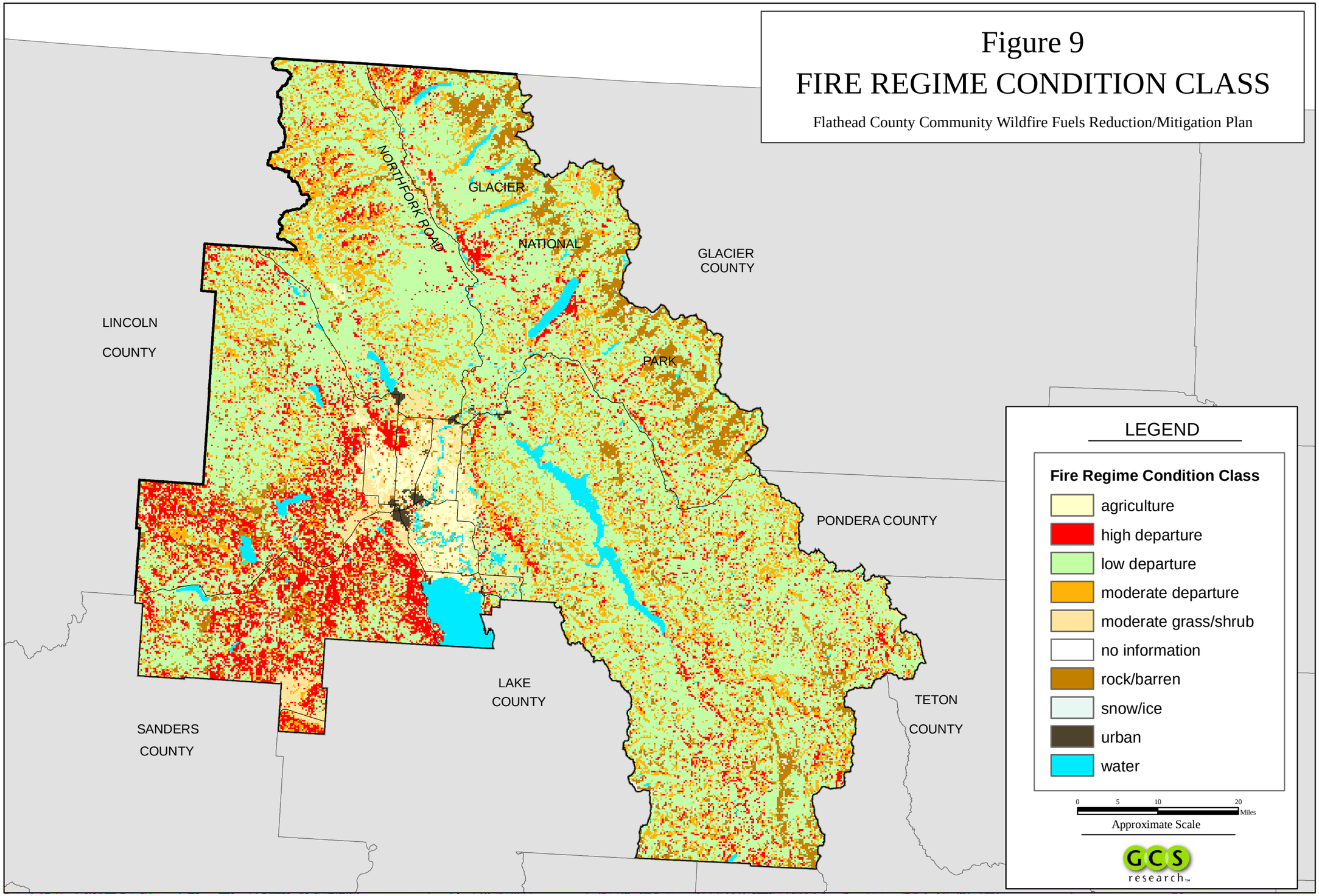

Figure 9: Fire Regime Condition Class for study area. USFS data and analysis.

Land Ownership Pattern

The Flathead Community Wildfire Fuel Reduction/Mitigation Plan covers an extensive land base. Approximating 5,252 square miles, Flathead County is roughly the size of the State of Connecticut. This plan encompasses an expansive and diverse land base with a growing human population.

Owner	**Acres**	**Square Miles**	**Percentage of Total**
U.S. Forest Service	1,760,584	2,750.9	52.4%
National Park Service	619,612	968.1	18.4%
Private	415,237	648.8	12.3%
Industrial Timber Lands	297,580	464.9	8.8%
State Trust Land	130,239	203.5	3.9%
Water	94,942	148.3	2.8%
Tribal Land	28,641	44.8	0.9%
US Fish and Wildlife Service	11,472	17.9	0.3%
Other State Land	2,889	4.5	0.1%
Other Federal	292	0.5	0.0%
Private Conservation	168	0.3	0.0%
Local Government	155	0.2	0.0%
Totals:	3,361,810	5,252.8	100%

Table 1: Source: Montana Natural Resource Information System. Industrial timber Lands and Private Lands were modified to reflect some timber lands categorized as private.

The largest land owner in Flathead County is the USFS. Any effective and sustainable wildland fire and fuel hazard mitigation plan requires collaboration between citizens and this land management agency. While the majority of the human population for Flathead County is concentrated in the central valley floor on private land, historical and contemporary growth patterns show an increase in population within the wildland urban interface (WUI). The Wildland-Urban Interface (WUI) is the area where houses meet or intermingle with undeveloped wildland vegetation . An increasing number of land ownership configurations exist wherein private land holders, structures, and entire subdivisions are adjacent to USFS managed forest lands fuel components and, therefore, are at risk for wildland fire events.

This ownership matrix requires effective, transboundary strategies for targeted fuel treatment prescriptions that maximize the risk reduction to private property while at the same time meet the management objectives of the agency. The same can be said for other federal and state lands as well as the industrial forestlands properties located in the study area.

Figure 10
OWNERSHIP

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

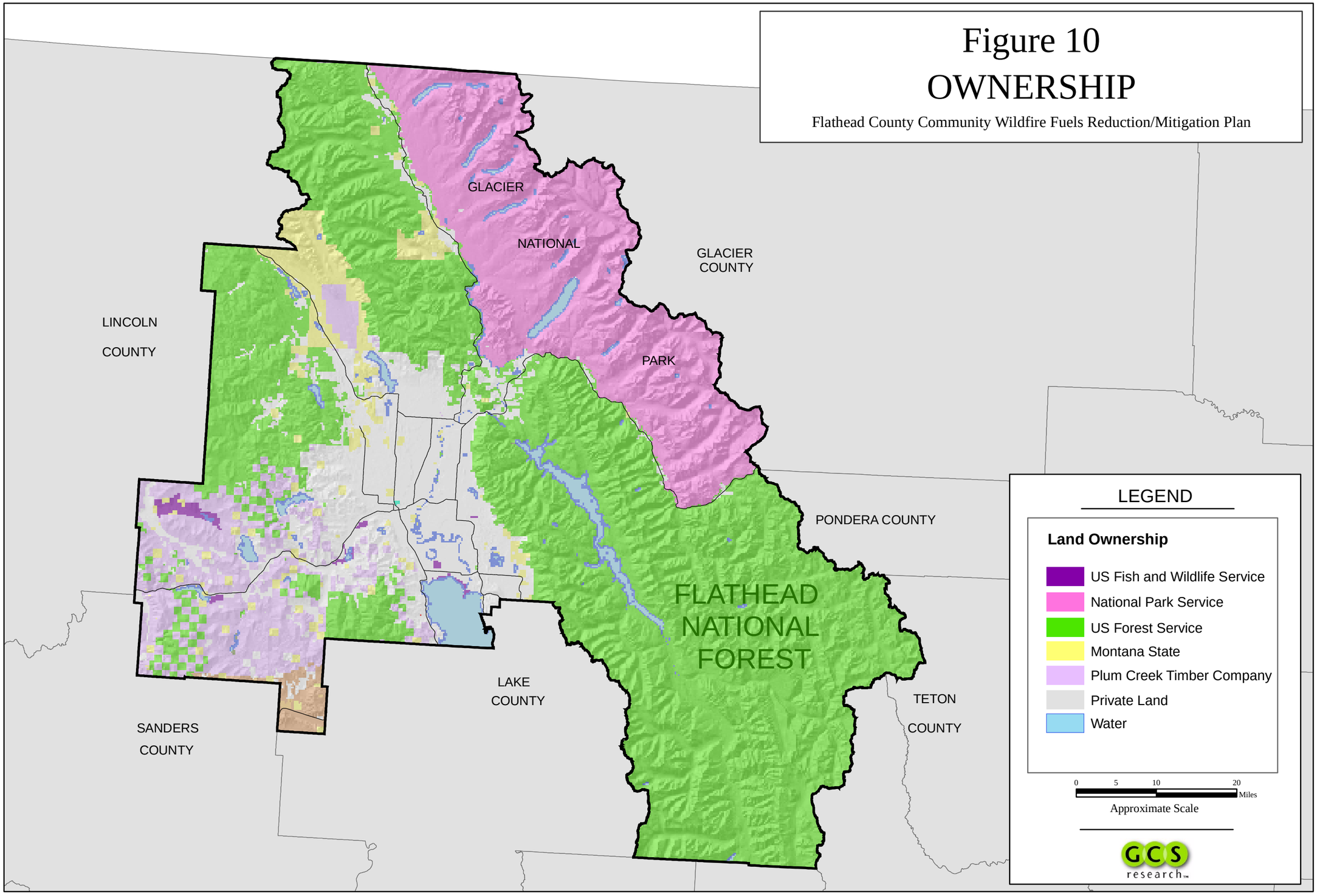

Figure 10: Flathead County major ownership classes for study area.

Throughout the planning process, and based upon the federal stakeholders' representation on the Flathead Steering committee, numerous, on-going efforts are attempting to address effective fuel treatment and hazard mitigation strategies within a number of geographical locations across the county. These efforts will be discussed in more detail in the prioritization discussion. Nevertheless, all parties are encouraged to continue these existing, collaborative efforts for community-based forest management to help reduce the risk associated with wildland fire with the localized WUI boundaries.

In addition to targeted fuel reduction plans for prioritized areas, it is also important to note that continued, on-going efforts toward homeowner education using programs such as FIREWISE are key to addressing risk reduction with mixed or multi-ownerships settings. Homeowners working together in a collaborative effort are much more effective than an individual homeowner, this is a key strategy to protecting community from large-scale fires that increasingly threaten homes across the study area.

One of the keys to this type of FIREWISE awareness is using GIS data currently available to the public on the Flathead County Internet Map Server. In addition to ownership information, this application hosts all of the priority and risk data for the CWPP as well as the full library of the County's GIS data. Furthermore, the County and rural fire districts can use this information to efficiently organize and prioritize their efforts. Detailed geospatial information can be shared via the Internet through interactive, web-based mapping applications maintained by Flathead County GIS Department.[18] As shown in Figure 11, it is currently possible for detailed fire district priority areas, Flathead National Forest Analysis areas, ownership, population, and parcel data to be determined for any area in the County.

[18] Please see: http://maps.co.flathead.mt.us/flathead/default.htm.

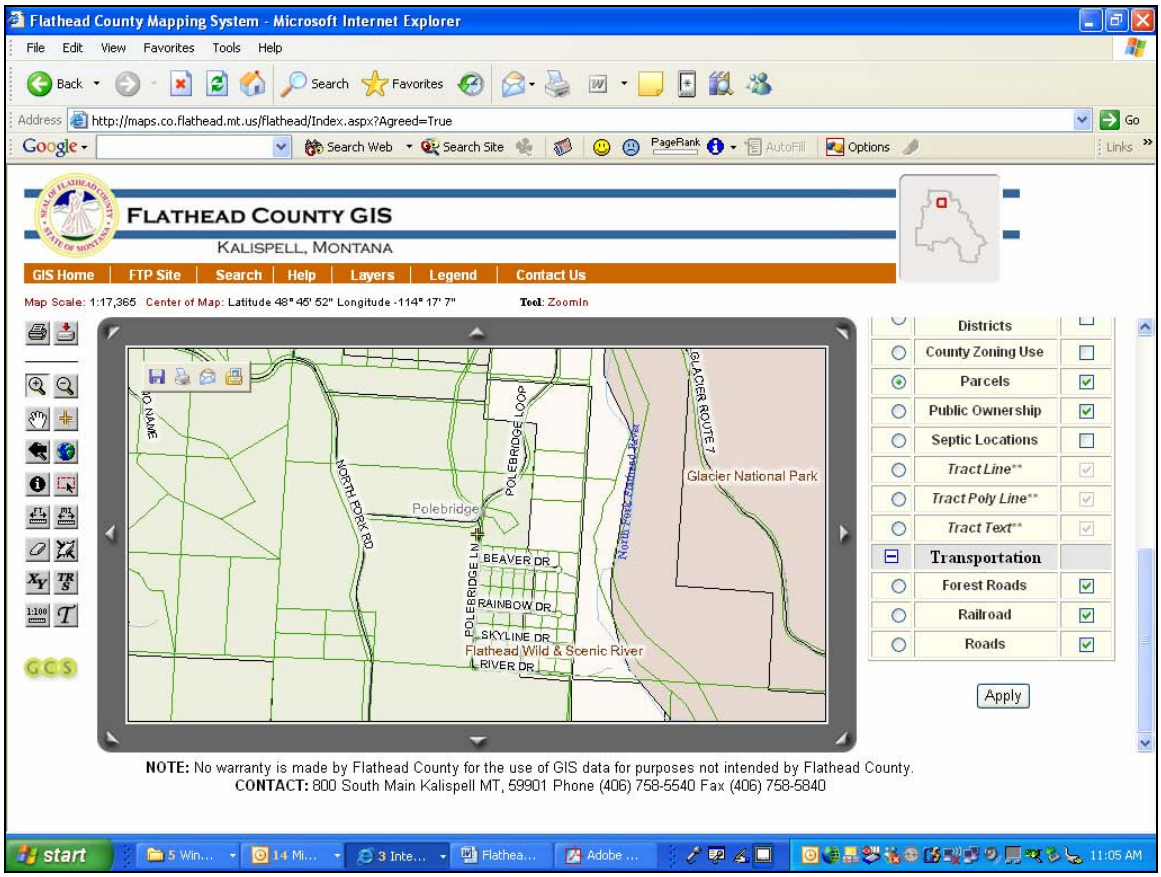

Figure 11: Flathead County web-based mapping application allows members of the public to zoom into any location within the county to examine parcel and land ownership information. GIS data from the CWPP planning process is hosted by this system. It is also possible for National Fire Protection Association (NFPA) 1144 home evaluation information to be included as part of the Flathead County geodatabase. Area shown is Polebridge, MT.

Population:

The latest projections from the US Census Bureau for the Flathead County (2004) show a total population of 79,485. Population totals for Flathead County should be considered approximate, since the County is experiencing considerable growth and has a lot of seasonal residents. As shown in Figure 12, the population density of Flathead County is concentrated in the main Flathead Valley bottom. Of course, this is based upon the presence of the major urban areas of the county: Kalispell, Columbia Falls, and Whitefish.

A final GIS map, Figure 13, shows the population density in relationship to major ownership classes in the Flathead study area. This type of analysis helps define the WUI across the study area and focus hazard mitigation efforts. However, it is important to realize that these types of geospatial analysis will require frequent updates and modifications in order to assess the rapid growth being experienced in various areas across Flathead County.

Each new subdivision, development, or other form of population increase in proximity to or within forested lands in effect increases the amount of land area within the WUI. Ideally, proposed developments should consider fuel mitigation strategies and FIREWISE approaches prior to actual development and inhabitation in order to reduce the risk associated with wildland fire and help protect life and property within potentially volatile conditions.

Figure 12
POPULATION PER SQUARE MILE

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

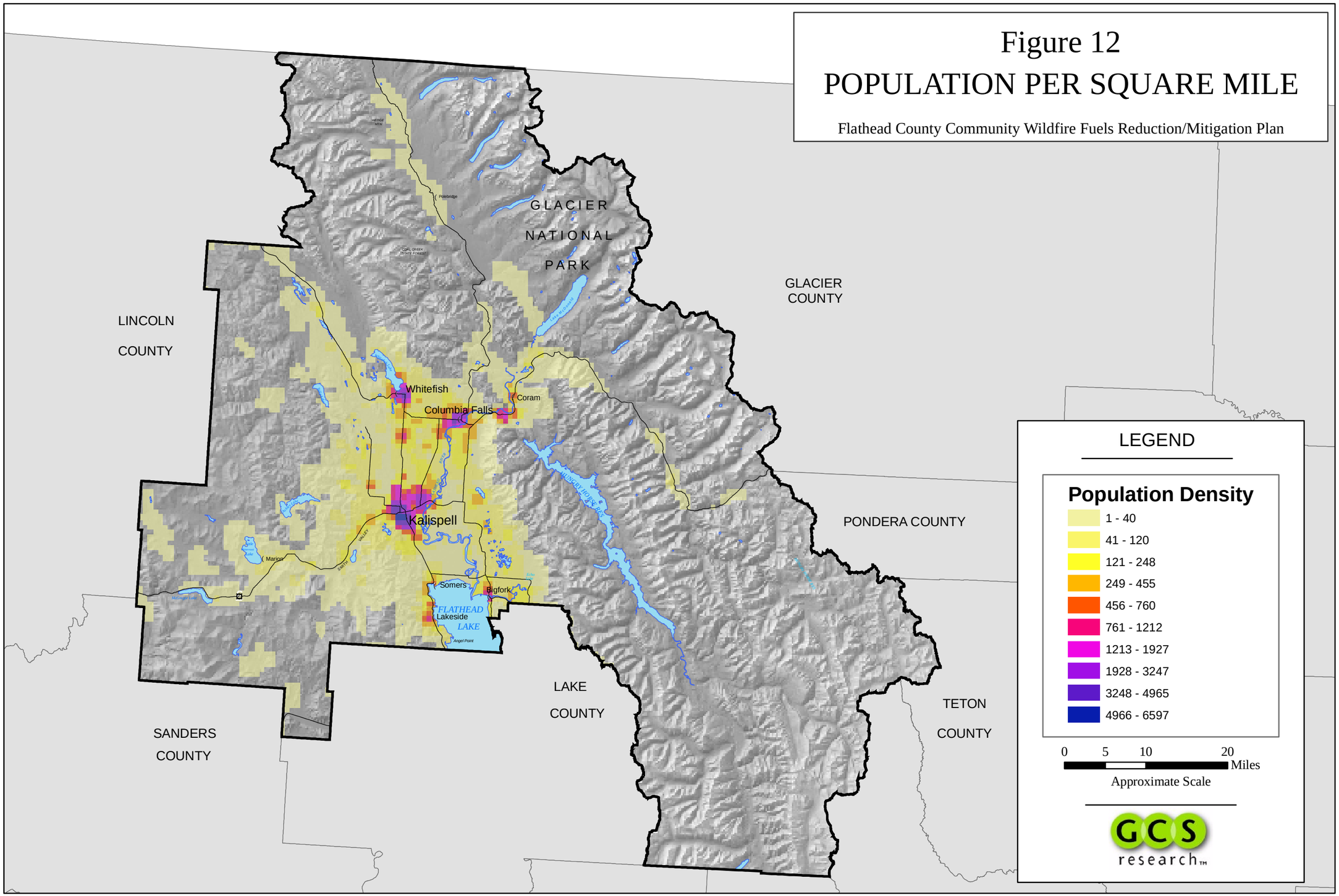

Figure 12: Flathead County study area showing population density per square mile.

Figure 13
POPULATION PER SQUARE MILE

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

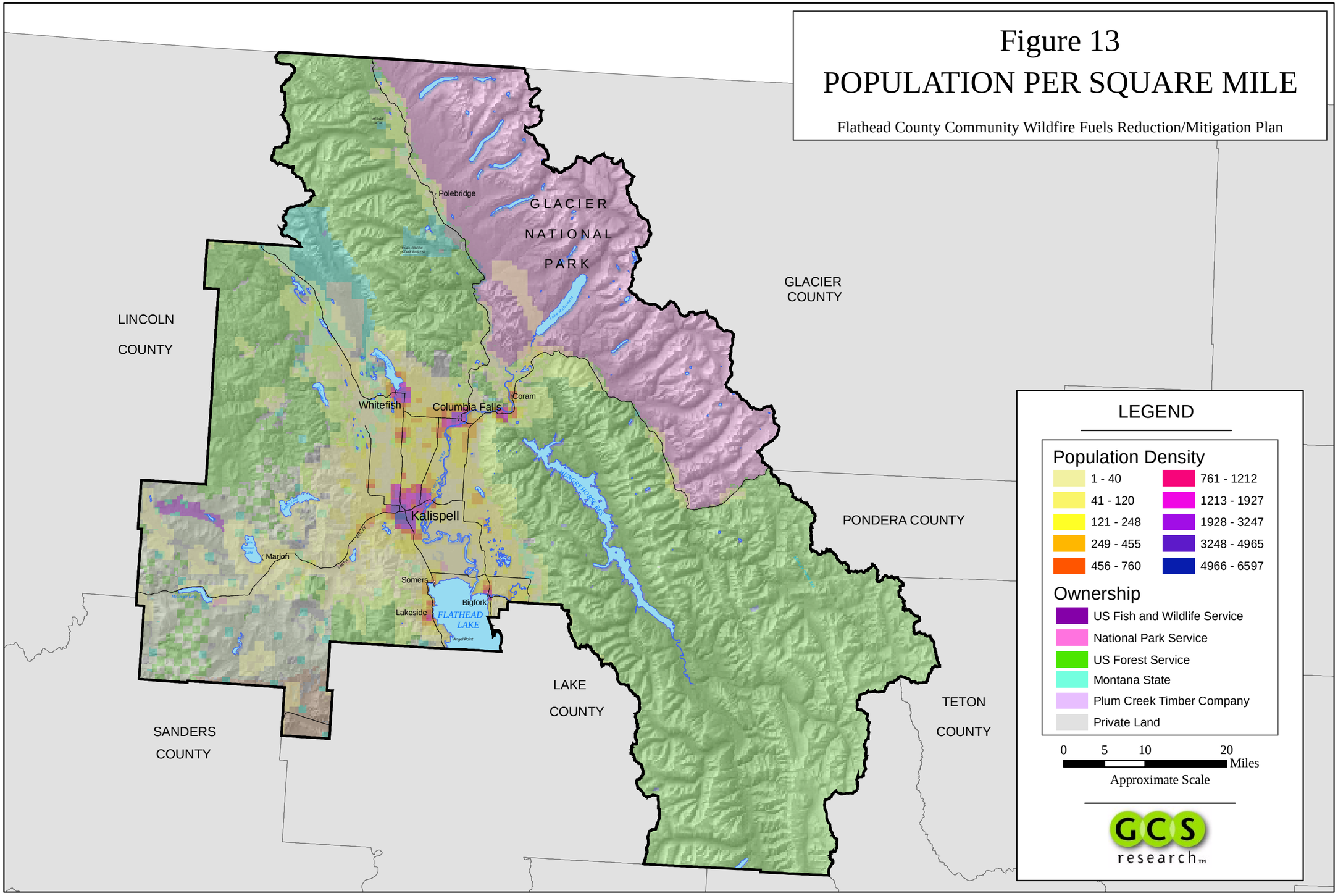

Figure 13: Population Density and Major Ownership Classes, Flathead County.

Defining the Wildland Urban Interface (WUI): Communities at Risk

A central component of this planning process involved the utilization of the best available GIS data and analysis to determine estimations of the Wildland-Urban Interface (WUI) and the communities at-risk within the WUI. In the following chapter, three unique geospatial methodologies for WUI definition and community risk assessment are described and documented.

As detailed in the HFRA, a commonly accepted definition of the Wildland-Urban Interface is the zone where structures and other human developments meet and intermingle with undeveloped wildland and vegetative fuel. As the WUI zone has expanded tremendously with population growth across the Intermountain West during the past 20 years, the risk to property and life has increased as well. This scenario is occurring in the Flathead County study area and will continue into the foreseeable future as increasing numbers of people seek the experience of living in a quasi-natural setting.

As a key goal of the Flathead Community Wildfire Fuels Reduction/Mitigation Plan, the Steering Committee actively pursued local-community involvement in the definition of the WUI and community risk assessment within the WUI. This is one of the clearly stated benefits of developing a CWPP. It provides local communities with the flexibility to define their own WUI, assess risk, propose treatments and prioritize fuel mitigation projects based upon a range of factors and values of important to people on the ground. To implement this process, a number of key steps were identified during the evolution of the project.

First, the most readily available WUI definition and community risk assessment for the entire study area was aggregated and processed. In large part, this resulted from effective collaboration with USFS Flathead National Forest and the utilization of spatial data developed by USFS Northern Region National Fire Plan Cohesive Strategy Team.

Community meeting participants utilized the extensive and well-documented USFS "Communities at Risk" analysis for initial examination, discussion, and evaluation.[19]

[19] See http://www.fs.fed.us/r1/cohesive_strategy/datafr.htm for detailed geospatial metadata for USFS "Communities at Risk" assessment.

Citing directly from the Cohesive Strategy Team geospatial metadata documentation[20]:

Abstract:

"Estimating the relative risk of communities to wildland fire requires the consideration of 3 factors: (1) the likelihood of fire occurrence; (2) the likely fire behavior should a given site catch fire; and (3) human settlement patterns. A spatial theme of ignition probability was derived from 20-years of fire occurrence data by interpolating between known fire locations and counting the number of fires within a 4-km2 neighborhood. Probable fire type (i.e., surface, passive crown, and active crown) during extreme fire weather was derived from plot-level data that was processed using the Fire and Fuels Extension to the Forest Vegetation Simulator (FFE/FVS). The model outputs for these plot data were then spatially extrapolated to similar biophysical settings. Human population density from the 2000 census was used as a proxy to the "wildland-urban interface". The raw population data were reassigned to smaller geographic units using a sequence of GIS filters including land ownership, land use, land cover, and slope. Lastly, we developed rule sets that integrated these 3 data themes into an estimate of the relative risk of the wildland-urban interface to wildland fires throughout northern Idaho and western Montana.

Purpose:

Communities-at-Risk was derived to illustrate the relative risk to human communities e.g., structures) should a wildland fire occur. These data were derived to characterize broad-scale patterns for regional and subregional assessments. The 90-meter raster data could be used to highlight the general vicinity of where risks occur, but the data was intended to be summarized across subwatersheds or other larger reporting units.

General Limitations:

Ignition probability was derived using a 4-km2 neighborhood. In addition, the probability surface was estimated using a specific geographic area; probabilities will vary relative to the geographic extent. Thus, do not use this layer for any other geographic extent. Although the resolution of the data is a 90-meter cell size, the expected accuracy does not warrant their use for analyses of areas smaller than about 10,000 acres (for example, assessments that typically require 1:24,000 data). These data are more appropriately used at mapping scales exceeding 1:100,000."

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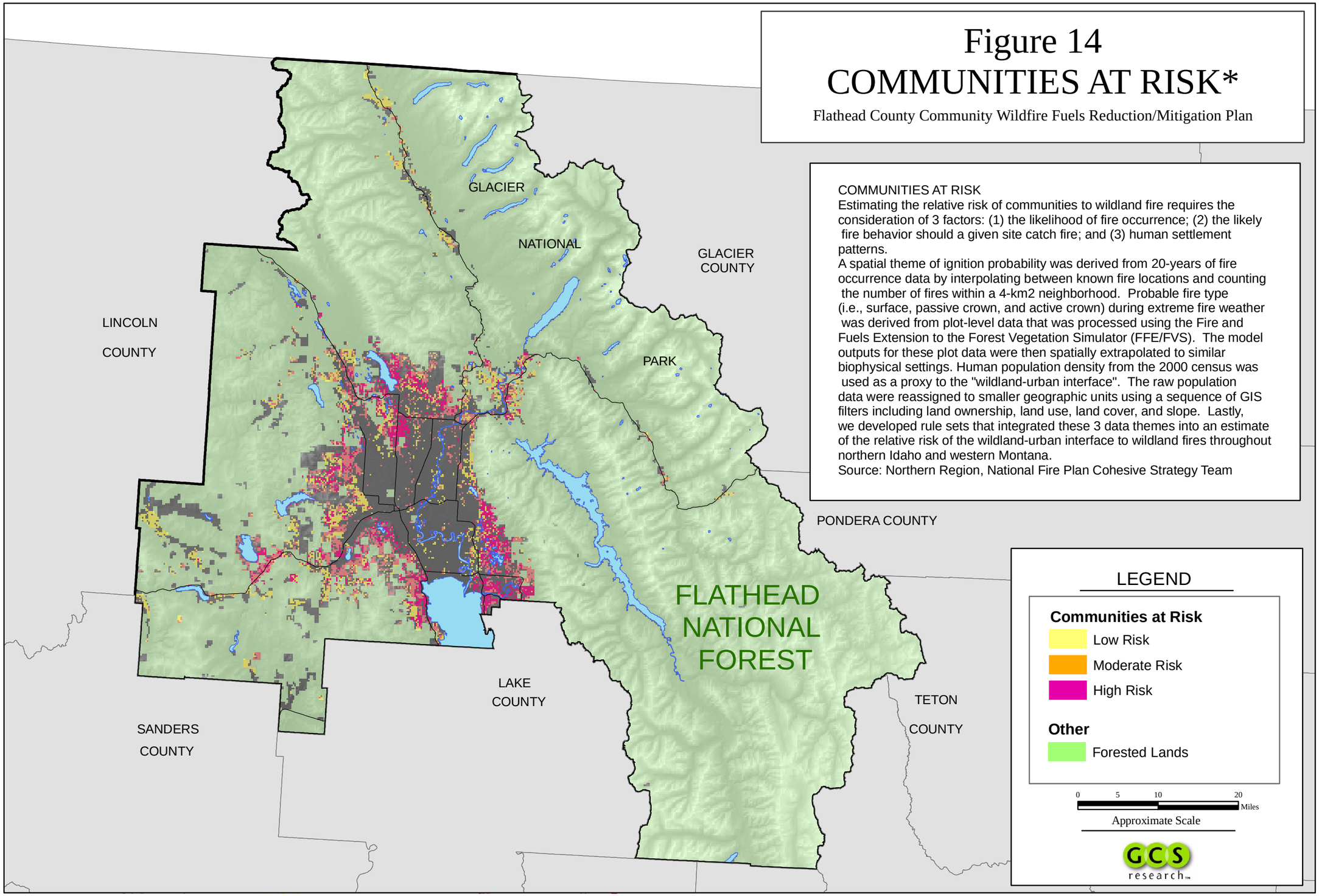
[20] http://www.fs.fed.us/r1/cohesive_strategy/datafr.htm

Figure 14
COMMUNITIES AT RISK*

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan



COMMUNITIES AT RISK

Estimating the relative risk of communities to wildland fire requires the consideration of 3 factors: (1) the likelihood of fire occurrence; (2) the likely fire behavior should a given site catch fire; and (3) human settlement patterns.

A spatial theme of ignition probability was derived from 20-years of fire occurrence data by interpolating between known fire locations and counting the number of fires within a 4-km2 neighborhood. Probable fire type (i.e., surface, passive crown, and active crown) during extreme fire weather was derived from plot-level data that was processed using the Fire and Fuels Extension to the Forest Vegetation Simulator (FFE/FVS). The model outputs for these plot data were then spatially extrapolated to similar biophysical settings. Human population density from the 2000 census was used as a proxy to the "wildland-urban interface". The raw population data were reassigned to smaller geographic units using a sequence of GIS filters including land ownership, land use, land cover, and slope. Lastly, we developed rule sets that integrated these 3 data themes into an estimate of the relative risk of the wildland-urban interface to wildland fires throughout northern Idaho and western Montana.

Source: Northern Region, National Fire Plan Cohesive Strategy Team

Figure 14: "Communtities at Risk" - Flathead County. Data and analysis by USFS.

Secondly, a WUI definition and risk assessment analysis for the study area was used based upon the methodologies and algorithms developed by the SILVIS Lab at the University of Wisconsin-Madison. The purpose of this additional analysis was to provide a contrasting perspective of WUI and risk assessment modeling as a means of stimulating further debate during the process.[21]

SILVIS WUI Definition and Geospatial Analysis Summary:

The Wildland-Urban Interface:

"The Wildland-Urban Interface (WUI) is the area where houses meet or intermingle with undeveloped wildland vegetation. This makes the WUI a focal area for human-environment conflicts such as wildland fires, habitat fragmentation, invasive species, and biodiversity decline. Using geographic information systems (GIS), we integrated U.S. Census and USGS National Land Cover Data, to map the Federal Register definition of WUI (Federal Register 66:751, 2001). These data are useful within a GIS for mapping and analysis at national, state, and local levels.

Housing Density

Housing density information was derived from U.S. Census data. Analysis was conducted at the finest demographic spatial scale possible, Census blocks, from the 2000 Census. All measures of housing density are reported as the number of housing units per square kilometer.

Landcover:

We utilized the National Land Cover Dataset, a satellite data classification produced by the USGS with 30m resolution based on 1992/93 imagery and available for the entire U.S. (Vogelmann et al. 2001) to identify 'wildlands'. Our definition of 'wildlands' encompasses a range of management intensities. NLCD classes that we included as 'wildlands' are forests (coniferous, deciduous and mixed), native grasslands, shrubs, wetlands, and transitional lands (mostly clear-cuts). We exclude orchards, arable lands (e.g., row crops) and pasture.

The Wildland-Urban Interface (WUI):

WUI is composed of both interface and intermix communities. In both interface and intermix communities, housing must meet or exceed a minimum density of one structure per 40 acres (16 ha). Intermix communities are places where housing and vegetation intermingle. In intermix, wildland vegetation is continuous, more than 50 percent vegetation, in areas with more than 1 house per 16 ha. Interface communities are areas with housing in the vicinity of contiguous vegetation. Interface areas have more than 1 house per 40 acres, have less than 50 percent vegetation, and are within 1.5 mi of an area (made up of one or more contiguous

[21] see http://silvis.forest.wisc.edu/Library/ for metadata on SILVIS Lab methodology.

Census blocks) over 1,325 acres (500 ha) that is more than 75 percent vegetated. The minimum size limit ensures that areas surrounding small urban parks are not classified as interface WUI.

Buffer Distance for Interface:

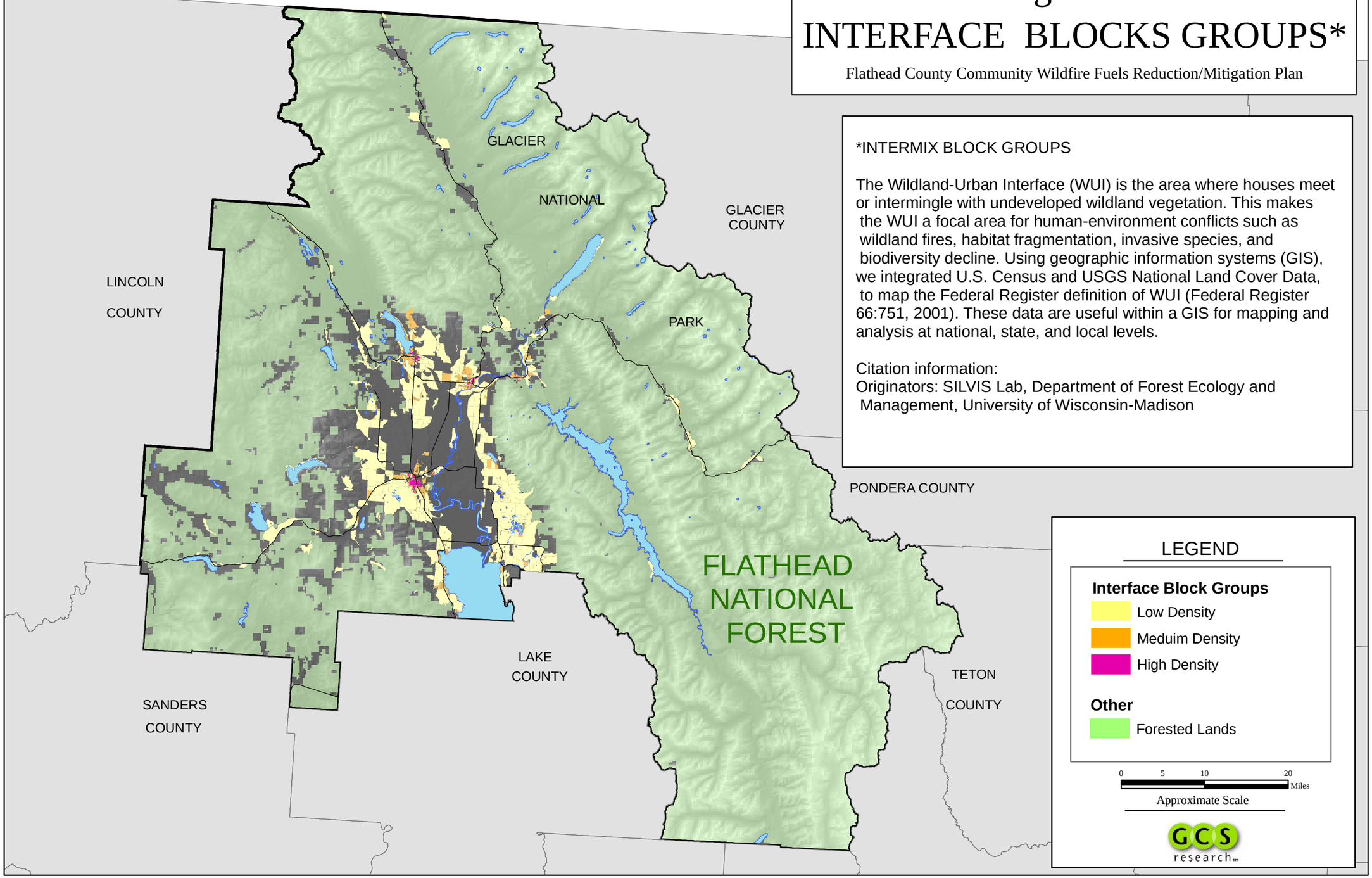
The California Fire Alliance (2001) defined "vicinity" as all areas within 1.5 mi (2.4 km) of wildland vegetation, roughly the distance that firebrands can be carried from a wildland fire to the roof of a house. It captures the idea that even those homes not sited within the forest are at risk of being burned in a wildland fire. We adopt this buffer distance to identify interface areas. With minimum housing densities, vegetation types, and interface buffer distances determined, the operational definition of the WUI is complete."[22]

It is interesting to note that a comparison of the USFS and SILVIS Lab WUI definition and associated at-risk community assessments reveal a high degree of spatial similarity.

[22] http://silvis.forest.wisc.edu/Library/WUIDefinitions2.asp

Figure 15
INTERFACE BLOCKS GROUPS*

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan



*INTERMIX BLOCK GROUPS

The Wildland-Urban Interface (WUI) is the area where houses meet or intermingle with undeveloped wildland vegetation. This makes the WUI a focal area for human-environment conflicts such as wildland fires, habitat fragmentation, invasive species, and biodiversity decline. Using geographic information systems (GIS), we integrated U.S. Census and USGS National Land Cover Data, to map the Federal Register definition of WUI (Federal Register 66:751, 2001). These data are useful within a GIS for mapping and analysis at national, state, and local levels.

Citation information:
Originators: SILVIS Lab, Department of Forest Ecology and Management, University of Wisconsin-Madison

Figure 15: Wildland Urban Interface Block Groups. Data and analysis based upon SILVIS lab methodology for modeling WUI.

Thirdly an additional WUI and communities at risk analysis was generated based upon the best available spatial data from Flathead County and the State of Montana. This product utilized the following processes and spatial data to derive a WUI definition.

As a first step, the WUI zone was defined as a 1.5 mile buffer extending out from lands that were actively managed as forests and, therefore, represented inhabited areas at potential risk from wildland fire. This included State of Montana, the USFS, and U.S. National Park Service managed forest lands.

Secondly, the State of Montana cadastral and CAMA data (Computer Assisted Mass Appraisal) were queried for individual parcels with structures. This resultant layer was combined with US Census Population Density for the entire study area. Finally, parcels that met the structure criteria were mapped at .5, 1.0, and 1.5 miles from managed forested lands. The resulting GIS product is viewable as Figure 16, and was presented along with the USFS and SILVIS WUI definition and boundary assessments.[23]

Figure 16b represents the final WUI designation by the Flathead County Community Wildfire Fuels Reduction / Mitigation Plan Steering Committee. This WUI zone was generated by identifying all forested lands within 1.5 miles of private lands and then selecting those lands with 1.5 miles of a structure. Forested lands data was derived from the USGS National Land Cover Dataset and the private lands data was derived from ownership data from the Montana State Library Natural Resource Information System (NRIS). Structures data was derived from the Montana State Computer Assisted Mass Appraisal database (CAMA).

[23] All of these data used in the public involvement process have FGDC compliant metadata and is maintained by the Flathead County GIS Department.

Figure 16
WILDLAND URBAN INTERFACE

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

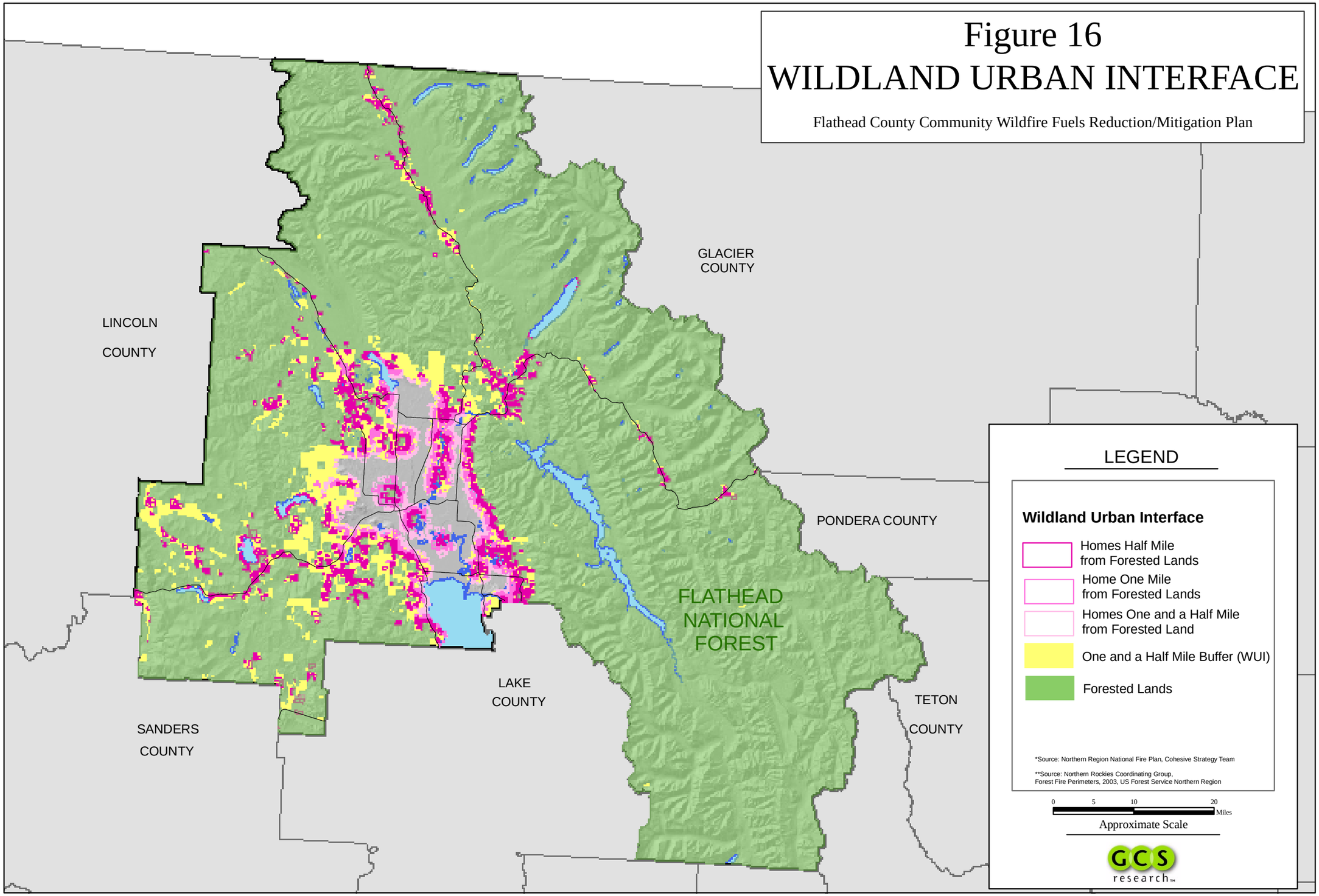


Figure 16: GCS Research analysis of WUI within Flathead Study Area.

FIGURE 16b

FINAL WUI

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

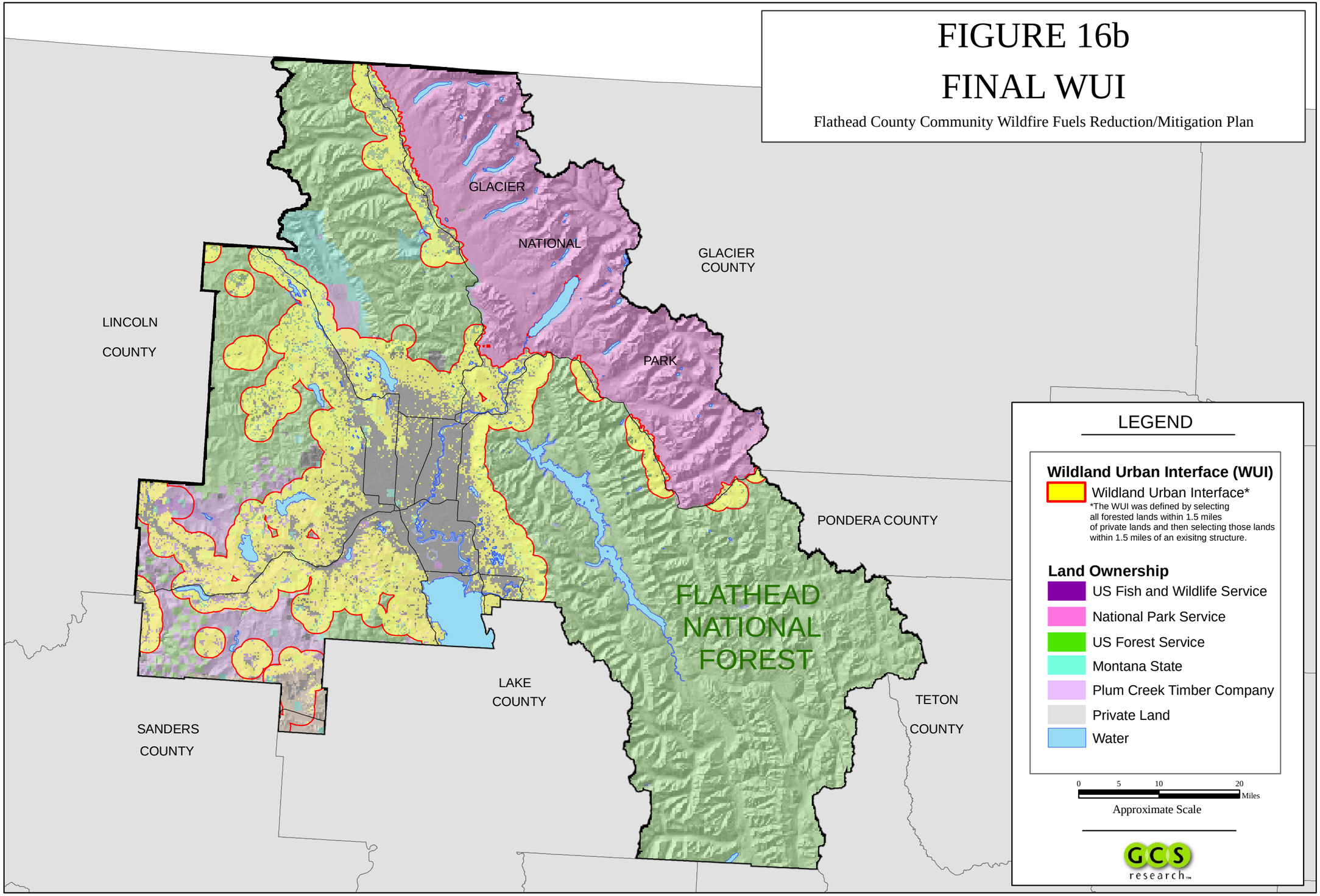


Figure 16b: Final Wildland Urban Interface delination as identified by Steering Committee.

Community Participation[1]: The Process of Prioritization

One of the overarching goals of the Flathead Community Wildfire Fuel Reduction/Mitigation Plan is to identify priority areas for wildfire protection and fuel reduction-mitigation. A series of meetings were conducted during the planning process in order to solicit input from community members in the identification of priority areas at the ground level. Fire Districts were involved at the onset of the plan and encouraged to participate.

The three primary WUI and communities at risk analyses were presented to local citizens during a series of open public meetings held across Flathead County in partnership with the local fire chiefs responsible for fire protection within their respective fire districts. A total of ten public meetings were conducted between October 21 and December 7, 2004. The meeting locations were designed to solicit public input from all 20 existing fire districts in Flathead County.

Fire district chiefs from each fire district were provided with detailed paper maps to document their professional opinions regarding local prioritization of hazard areas. Fire Department personnel identified areas of concern on their respective maps and in most cases, prioritized those areas. This information was aggregated for each fire district and digitized into the Flathead GIS.

During these meetings, interested parties had the opportunity to review the initial analyses conducted and/or aggregated for the plan. Large-scale maps for respective meeting areas and fire districts were also created and presented in order to facilitate a more geographically detailed presentation of individual properties within the WUI zone. Local citizens had an opportunity to question the preliminary analysis, express their arguments for prioritization within their respective communities, and suggest modifications and alterations to the predefined WUI zones.

[1] Please see Appendix E for public announcement documentation.

Figure 17
FIRE DISTRICTS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

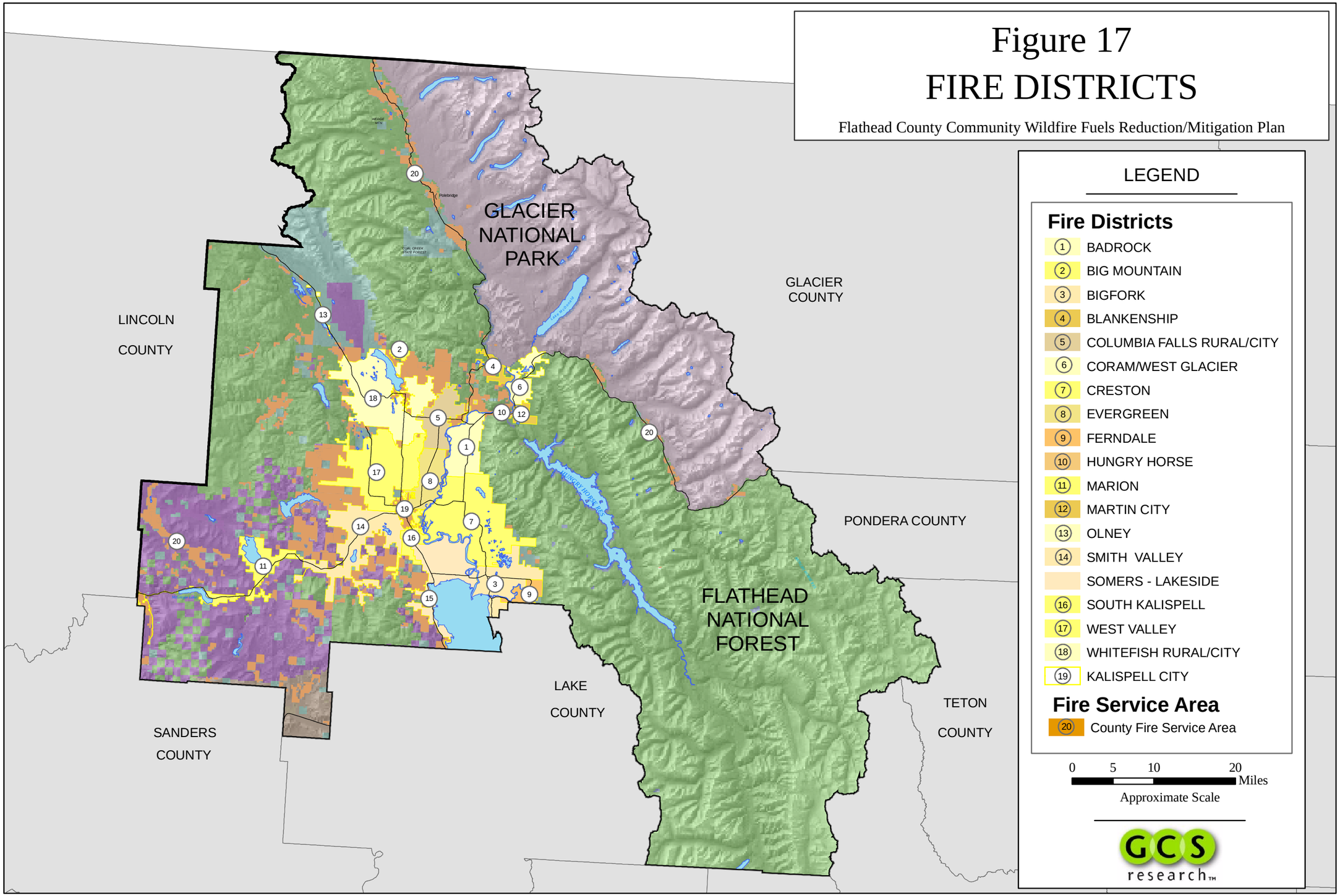


Figure 17: Fire Districts displayed with ownership, Flathead County.

Photo 1: Marion Fire District Community Meeting. Fall 2004. CWPP Planning Process.

Most importantly, participants had the opportunity to determine priority areas for fuel treatment projects on federal and non-federal lands in the WUI. In many instances, meetings documented priority areas that had already been defined by local citizen groups working in collaboration with land management agencies to identify priority areas for fuel mitigation work.

Community Meetings Schedule, Locations, and Fire Districts:

1) Fire Districts: Bigfork, Creston, and Ferndale Fire Districts
   October 21, 2004
   Location: Bigfork Fire Hall

2) Somers – Lakeside Fire Districts
   October 22, 2004
   Location: Somers Fire Hall

3) Whitefish City Fire, Whitefish Fire Service Area, Big Mountain Fire District, and Olney Fire District
   October 26, 2004
   Location: Whitefish Fire Hall

4) Columbia Falls City Fire, Columbia Falls Rural Fire District, Badrock Fire District
   October 27, 2004
   Location: Columbia Falls Fire Hall

5) Coram – West Glacier Fire District, Martin City Fire District, Hungry Horse Fire District, and Fire Service Area (West)
   October 28, 2004
   Location: Canyon Community Church

6) Northfork Area, Fire Service Area (East)
   October 29, 2004
   Location: Sonderson Hall

7) Marion Fire District
   November 1, 2004
   Location: Marion Fire Hall

Photo 2: Marion Fire District Community Meeting – Marion, Fall 2004.

8) West Valley Fire District, Smith Valley Fire District
November 3, 2004
Location: Smith Valley Fire Hall

9) Evergreen Fire District, South Kalispell Fire District, Kalispell City Fire
November 4, 2004
Location: Smith Valley Fire Hall

Photo 3: Smith Valley Rural Fire District Community Meeting. Fall 2004.

10) Final Review of Priority Areas (All Fire Districts)
December 7, 2004
Location: Hampton Inn, North Fork Room, Kalispell

This process highlights the significance of the community-based fire protection planning. Despite the relative uniformity and consistency associated of the geospatial analysis described above (USFS, SILVIS, GCS Research), there are inherent limitations to a top-down process devoid of community input. As noted, the remotely sensed data

inherent to specific geospatial analysis is at such a coarse scale as to be inappropriate for use below certain scales, i.e., 1:100,000.

Secondly, it is difficult in all instances to quantify additional values at risk, professional local knowledge and expertise of fire risk at local scales, and on-going efforts at fire risk prioritization and resultant fuel treatment efforts. The community meetings provided an opportunity for interested citizens to openly inform the process through an effective dialogue designed to capture localized definition of the WUI. As such, the Flathead Plan successfully executes the prime opportunity intended by the HFRA.

Rather than rejecting the WUI and communities at-risk geospatial definitions, community input on boundary definition generally confirmed the analysis while adding important clarifications, large-scale definitions, notable exceptions, and additional insights. These inputs were carefully documented on existing paper maps during and following the community meetings, and digitized into the Flathead Plan GIS. Against this solid backdrop of pre-existing geospatial analyses, it is the localized definition of the WUI and the prioritization of risk reduction projects, which serve as the most valuable outcome of the community-involvement process.

Figure 18
PRIORITY AREAS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

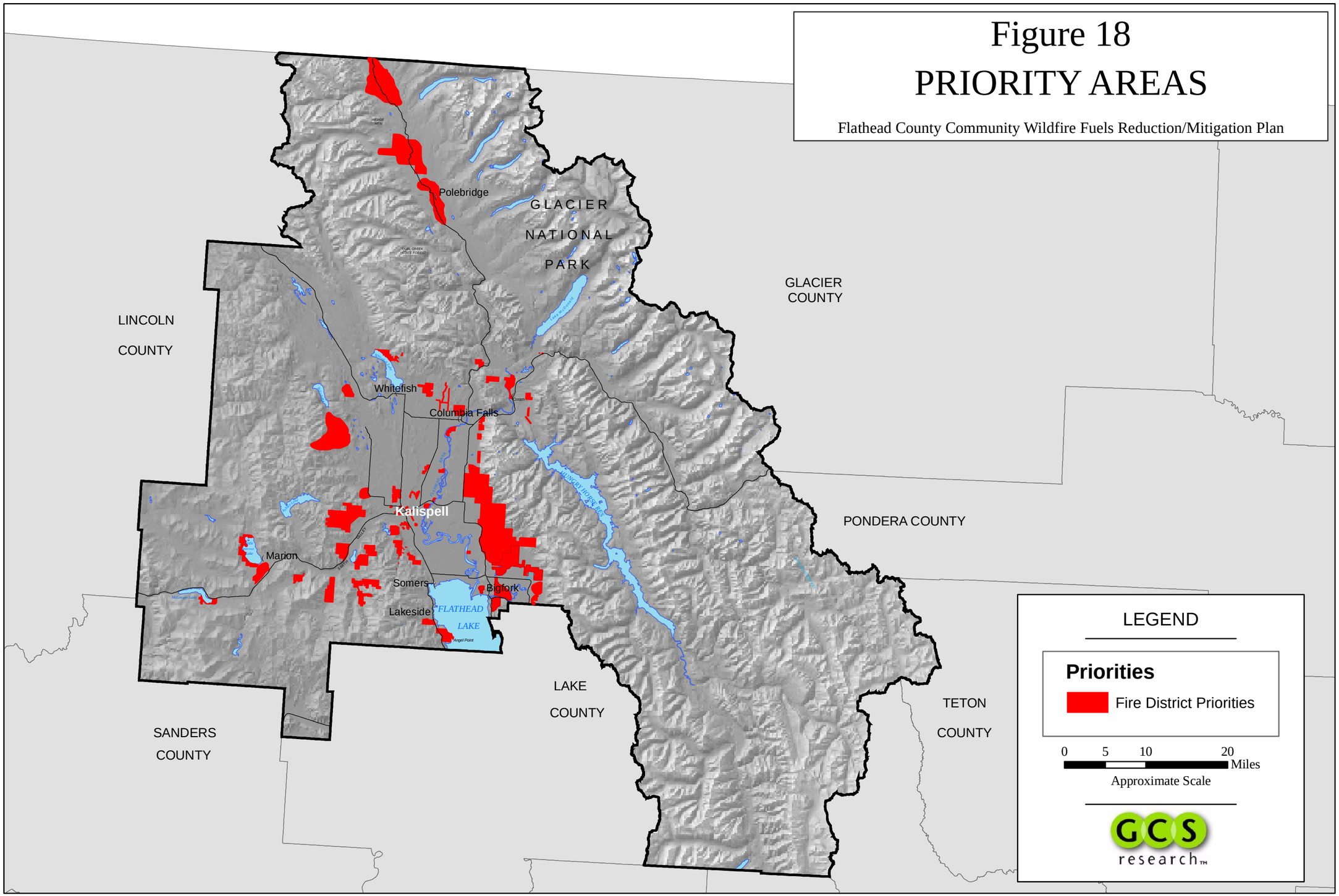


Figure 18: Flathead County Fire District Priority Areas - Coarse scale analysis

Detailed Prioritization Analysis within the WUI: Setting Objectives

The outcome of the community involvement process, the solicitation of professional opinion and comments by local fire district chiefs, and other participating stakeholders is a prioritization analysis for the entire study area. These areas reflect the community's prioritized area recommendations for fuel treatments projects and/or other wildland fire mitigation strategies for communities at risk with the modified WUI. The Flathead National Forest has also identified proposed areas for fuel reduction and mitigation. These areas were provided by the Flathead National Forest in both electronic GIS format and paper map format.

These detailed analyses are presented by fire district. In areas where existing fire districts had established existing priority areas for fuel mitigation projects, these reports are maintained in their entirety as appendices. There are two primary cartographic outputs in this series: 1) priority areas within defined fire district boundaries; and 2) priority areas as defined by ownership parcels where structures (buildings) are present.[25]

The methodology for the economic analysis for each priority area is as follows: Each priority area identified was digitized into the GIS. The priority area polygons were then used to identify parcels with structures either completely contained within the priority area, or intersected the priority area. These parcels were then used to calculate the average building value for a priority area. The dollar value for buildings were derived from the Montana Department of Revenue Computer Assisted Mass Appraisal (CAMA) database.[26]

The parcel maps also show ownership within and outside particular fire district boundaries. The intended purpose of this series of maps is to detail specific priority areas requiring attention across ownership jurisdictions.[27]

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[25] All of these GIS analysis outputs are available as .pdf documents and as ArcGIS .mxd project files and are delivered as the geospatial output components of the Flathead Community Wildfire Fuel Reduction/Mitigation Plan.

[26] http://gis.doa.state.mt.us/

[27] Parcels were queried to determine which parcels have buildings. These parcels with buildings were then selected by location, either falling completely within or intersecting the priority area. The data used for parcels was the State of Montana Cadastral dataset, with associated attribute information from the Computer Assisted Mass Appraisal (CAMA) database. All values should be considered approximate, since the priority areas themselves are sometimes generalized, and the CAMA data occasionally has duplicate records.

At this time, priority area confirmation and review documentation has not been received for the Olney and Hungry Horse Fire Districts.

It should also be noted that Big Mountain Fire District has developed and actively maintains its own fire plan for its area of responsibility. This document and it is available upon request from the Big Mountain Fire District Chief.

Badrock Fire District 18,144 Acres[28]
Priority Areas 1,813 Acres

- Priority Area Number 1 – Kelley Road = 163 Acres
- 22 Parcels with buildings
- Low/high $37,948 - $268,172
- Average building value = $128,481

- Priority Area Number 2 – Hems Road = 210 Acres
- 25 Parcels with buildings
- Low/high $16,910 – $257,380
- Average building value = $88,768

- Priority Area Number 3 – Wapiti Meadows / Mooring Meadows = 713 Acres
- 72 Parcels with buildings
- Low/high $6,440 - $482,000
- Average building value = $147,137

- Priority Area Number 4 – Spruce Mtn / Elk Park Roads = 217 Acres
- 11 Parcels with buildings
- Low/high $69,160 – $148,210

Flathead County Fire Service Area (FSA):
The FSA is responsible for all lands outside of established fire districts. Since this area is not defined by polygonal boundaries, it is difficult to perform the same analysis as individual fire districts, each with a district boundary and clearly defined priority areas. The FSA can be divided into FSA-East, FSA-West, FSA-North
The FSA West priority areas are:

- Ashley Lake
- Pleasant Valley
- Hubbard and Sullivan Creek area

FSA-East priorities are:

- Middle Fork Essex Pinnacle Area

FSA-North priorities are:

- North Fork Area (See Addendum)

[28] All calculations are approximate and based upon best available GIS data and tax record information provided by State of Montana.

- Average building value = $119,033

- Priority Area Number 5 – Berne Road = 173 Acres
- 32 Parcels with buildings
- Low/high $8,060 - $179,644
- Average building value = $81,726

- Priority Area Number 6 – Kokanee Bend = 338 Acres
- 23 Parcels with buildings
- Low/high $9,810 – $337,770
- Average building value = $120,900

Bigfork Fire District 22,035 Acres
Priority Areas 8,395 Acres

- Priority Area Number 1 – Echo Lake = 5,517 Acres
- 472 Parcels with buildings
- Low/high $390 - $3,359,230
- Average building value = $123,176

- Priority Area Number 2 – Swan Hill = 1,769 Acres
- 105 Parcels with buildings
- Low/high $2,040 – $1,738,220
- Average building value = $164,704

- Priority Area Number 3 – East Shore Area = 844 Acres
- 50 Parcels with buildings
- Low/high $4,730 - $829,760
- Average building value = $189,045

- Priority Area Number 4 – Chapman Hill = 265 Acres
- 129 Parcels with buildings
- Low/high $820 - $2,543,360
- Average building value = $294,767

Big Fork District Fire Chief Comments (Priority Area Review):

- *Echo Lake area and the Swan Hill area as shown.*
- *Lesser areas of concern are the East Shore area and the Chapman Hill area.*
- *Excessive forest fuel loading and density are the primary concerns.*
- *A west facing slope adds problems to the Swan Hill area and some of the East Shore area.*

- *There are some access and water concerns but they are not nearly as significant as those priorities identified above*
- *Overall, I feel that our fire district is in better shape and of less risk than some of Flathead County's western and northern fire districts.*

Big Mountain Fire District 1,443 Acres
Priority Areas 43 Acres

- Priority Area Number 1 – Glades = 9 Acres
- 0 Parcels with buildings
- Low/high n/a
- Average building value = n/a

- Priority Area Number 2 – Elk Meadows Phase 1 = 34 Acres
- 0 Parcels with buildings
- Low/high n/a
- Average building value = n/a

Blankenship Fire District 3,662 Acres
Priority Areas 1,212 Acres

- Priority Area Number 1 = 517 Acres
- 7 Parcels with buildings
- Low/high $11,360 - $268,940
- Average building value = $120,811

- Priority Area Number 2 = 320 Acres
- 16 Parcels with buildings
- Low/high $12,625 – $299,430
- Average building value = $93,755

- Priority Area Number 3 – Spoon Lake = 375 Acres
- 61 Parcels with buildings
- Low/high $290 - $193,974
- Average building value = $70,003

Blakenship District Fire Chief Comments (Priority Area Review):

- *Water. Only have one tender a 1954 vintage. The river is designated as wild and scenic and cannot put in a dry hydrant.*
- *Roads to houses… bad access, the Teakettle Road is bad, it forks into three different Teakettle Roads*
- *Consider a piping system with dry hydrant out of Spoon Lake.*

- *Need Fuel reduction on adjacent USFS lands.*

Columbia Falls Rural Fire District 16,421 Acres
Priority Areas 1,123 Acres

- Priority Area Number 1 – Trumbull Canyon Road = 170 Acres
- 54 Parcels with buildings
- Low/high $1,840 - $213,012
- Average building value = $69,953

- Priority Area Number 2 – Subdivision = 879Acres
- 180 Parcels with buildings
- Low/high $490 – $244,200
- Average building value = $68,379

- Priority Area Number 3 – Witty Lane = 74 Acres
- 68 Parcels with buildings
- Low/high $3,670 - $269,020
- Average building value = $86,564

Coram / West Glacier Fire District 9,902 Acres
Priority Areas 890 Acres

- Priority Area Number 1 – Railroad Crossings and One Way in/out = 598 Acres
- 96 Parcels with buildings
- Low/high $360 - $184,920
- Average building value = $40,538

- Priority Area Number 2 – Coram Experimental Forest = 284 Acres
- 4 Parcels with buildings
- Low/high $32,210 – $163,854
- Average building value = $78,587

- Priority Area Number 3 – Historical Structure = 7 Acres
- 1 Parcels with buildings
- Low/high $207,700
- Average building value = $207,700

- Priority Area Number 4- Railroad Crossing = 0.7 Acres
- 0 Parcels with buildings
- Low/high n/a
- Average building value = n/a

Creston Fire District 53,547 Acres
Priority Areas 22,853 Acres

- Priority Area Number 1 – Many Lakes = 3,902 Acres
- 404 Parcels with buildings
- Low/high $4,590 - $837,140
- Average building value = $124,144

- Priority Area Number 2 – Foothill Road = 5,980 Acres
- 279 Parcels with buildings
- Low/high $1,930 – $1,498,160
- Average building value = $96,321

- Priority Area Number 3 – Lindsay Lane / South Echo Lake = 4,921 Acres
- 312 Parcels with buildings
- Low/high $290 - $1,741,490
- Average building value = $143,490

- Priority Area Number 4- Bachelor Grade / North Lake Blaine = 7983 Acres
- 597 Parcels with buildings
- Low/high $390 – $698,910
- Average building value = 130,751

- Priority Area Number 5 - Ranchettes = 67 Acres
- 30 Parcels with buildings
- Low/high $1,500 – $168,838
- Average building value = $63,532

Creston District Fire Chief Comments (Priority Area Review):

- ***Many Lakes:***
  Large population, "one way in/outs" dead end roads. Heavy smoke potential, slope in many places. Water supply, narrow driveways, few refuge areas.
  LARGE POTENTIAL FOR LIVES LOST.

- ***Foothill Road:***
  Heavy Timber, Main Road artery, direct path of fire spread from Echo / Many lakes. Water supply, difficult to "reach from the back".

- ***Lindsay Lane / South Echo Lake:***
  Heavy timber, narrow driveways, some slope issues, access issues- limited. Growing population, contiguous with federal and state lands. Heavy smoke potential, few refuge areas.

- ***Bachelor Grade South / Lake Blaine- Slope on Eastern Side:***
  Growing population. Many narrow roads, dead ends. Water supply. City dwellers in the country.

- ***Ranchettes:***
  Many homes in small wooded area. Short term event. All access from downwind side.

Evergreen Fire District 14,734 Acres
Priority Areas 683 Acres

- Priority Area Number 1 –USFWS lands = 170 Acres
- 2 Parcels with buildings
- Low/high $11,400 - $61,930
- Average building value = $36,665

- Priority Area Number 2 – Campground on River = 44 Acres
- 1 Parcels with buildings
- Low/high $263,700
- Average building value = $263,700

- Priority Area Number 3 – Glacier Subdivision = 210 Acres
- 4 Parcels with buildings
- Low/high $18,630 - $439,500
- Average building value = $169,712

- Priority Area Number 4- End of Bayou Road = 136 Acres
- 18 Parcels with buildings
- Low/high $93,020 – $320,360
- Average building value =

- Priority Area Number 5 – Plum Creek Mill = 123 Acres
- 7 Parcels with buildings
- Low/high $100,100 - $983,100
- Average building value = $352,386

Evergreen District Fire Chief Comments (Priority Area Review):

- ***USFWS River Area:***
  Access: Limited access …main owner is USFWS, swampy brush
  No access… campground on river

- ***Glacier Subdivision:***

A new development that will have 64 acres of parkland and houses in the timber. Fire Chief will watch this one as it develops.

- ***End of Bayou Road:***
  End of Bayou Road, gated and posted. There are houses.
  Plum Creek Mill

Ferndale Fire District 5,585 Acres
Priority Areas 1,273 Acres

- Priority Area Number 1 – Bear Creek Area = 958 Acres
- 38 Parcels with buildings
- Low/high $42,440 - $607,580
- Average building value = $236,637

- Priority Area Number 2 – Tamarack Lane = 315 Acres
- 14 Parcels with buildings
- Low/high $3,120 – $178,995
- Average building value = $84,505

Ferndale District Fire Chief Comments (Priority Area Review):

- ***Bear Creek Area:***
  Sloped, borders NF, access-one road

- ***Tamarack Lane:***
  Houses on slopes, borders NF, Access- one road

Hungry Horse Fire District 808 Acres
Priority Areas have not been defined.

According to the Forest Service fire specialist who talked with the then-Hungry Horse Fire Chief when the Hungry Horse-to-West Glacier project was being put together, the area that Hungry Horse was worried about was the acreage south of the highway just over (on the Hungry Horse side) the US Highway 2 bridge across the South Fork of the Flathead River. The area is currently being treated by the Forest Service.

Kalispell City Fire District[29]
Priority Areas 1,219 Acres

Kalispell Fire Department Comments (Priority Area Review)

(Number refers to number on map – Figure 40)

1) *Primarily grass and no slope on the west side. East side has an east aspect, is brush and trees along the Stillwater River.*
2) *Grass, some brush, with an east slope*
3) *Grass, some brush, south slope. BNSF RR.*
4) *This is airport property and is no slope grass, with interspersed wood buildings*
5) *Grass, no slope*
6) *While this area is not in the city, it is surrounded by the city. Property is a flood plain of Ashley Creek, has brush, difficult access, and some grass.*
7) *Grass, no slope.*
8) *Brush, some grass, no slope, BNSF RR.*
9) *Brush, creek frontage. No slope. Difficult access.*
10) *Surrounded by commercial and residential. Grass, with a high angle west slope on the east side. Difficult access.*
11) *Grass, some brush. West and east slope.*
12) *Grass, both in the city and outside the city. South and west slope. High density residential to the east and south.*
13) *Grass, with east, north, and west slope in the southwest corner. Otherwise no slope.*
    Property is undergoing commercial development in the Northwest corner. Has irrigated athletic fields in the Southeast corner.
14) *South slope, grass, brush, and trees. Difficult access.*
15) *East slope, grass and brush. Difficult access.*
16) *This is undeveloped park land. Slopes are east and north. Heavy brush, dead timber, and no access.*

Marion Fire District 19,141 Acres

[29] The Fire District GIS data provided by the County does not have the Kalispell City Fire District Boundary in polygon format, accurate calculation of acres is not feasible with existing data resources.

Priority Areas 3,982 Acres

- Priority Area Number 1 –McGregor Lake = 522 Acres
- 44 Parcels with buildings
- Low/high $2,570 - $223,120
- Average building value = $58,191

- Priority Area Number 2 – Marion Mountain = 1,640 Acres
- 66 Parcels with buildings
- Low/high $1,360 – $159,616
- Average building value = $66,236

- Priority Area Number 3- Bitterroot Lake = 1,820 Acres
- 178 Parcels with buildings
- Low/high $490 – $977,230
- Average building value = $89,507

Marion District Fire Chief Comments (Priority Area Review):

- ***McGregor Lake***

  This subdivision has a grant pending for fuel mitigation, and is a high priority because it is heavily timbered; many houses are close together and have older frame construction. There is a small strip of State land on the south shore of the lake with several leased parcels with structures bunched together with timber and brush encroaching. This area borders Plum Creek and is considered high risk because of the prevailing wind direction and the fact a there is potential for a large fire to occur on the Plum Creek and State land to south and west and move into this subdivision.

  Other Concerns:

  One way in – one way out. 6 inch hydrant.

- ***Bitterroot Lake:***
  The north west and south west side of the lake have subdivisions, a lot of new construction: heavily timbered; high density of houses. Both one way in one way out for both subdivisions. There is talk of connecting the two roads. There is a 10-15 minute drive / response time to the north end of the lake from the fire station.

  Getting water from the lake is an issue because of access to draft sites on the lake. On the north end, need to widen the canopy along the road, and need to develop a safety zone in the subdivision, near the end: 300' radius.

Other Concerns:

Need to get home owners to create defensible space, brush and timber encroach many homes.

Recommendation for Firewise Outreach

This site is directly adjacent to Plum Creek and State lands, the site is to the west and the wind direction is from west to east, putting this community at risk should a large fire occur on PC or state lands.

- ***Marion Mountain***

  Best to treat individual homes.

  There are other areas with a density of homes and fuel, identified by the assistant fire chief as priorities.

  Northeast of McGregor Lake, on the north side of highway 2; south and south east of Bitterroot Lake including Marion Mtn. There is a substation in timber see map.

Martin City Fire District 3,483 Acres
Priority Areas 146 Acres

- Priority Area Number 1 – Forest Service Lands = 56 Acres
- 2 Parcels with buildings
- Low/high $26,070 - $169,600
- Average building value = $97,835

- Priority Area Number 2 – Coram Experimental Forest = 90 Acres
- 2 Parcels with buildings
- Low/high $47,790 – $115,240
- Average building value = $81,515

Martin City District Fire Chief Comments (Priority Area Review):

- ***US Forest Service Boundary Comments:***

The number one priority is an area in the south east part of the district. There are only a few homes in this area, but it is thick with forest, the adjacent land owner is the FS.

Number two priority is fuel reduction on the Coram Experimental Forest. On the east side of the district boundary. No one expects this to happen.

Olney Fire District 1,018 Acres
Priority Areas have not been defined yet

South Kalispell Fire District 7,073 Acres
Priority Areas 683 Acres

- All of the priority areas in the South Kalispell Fire District are access and safety zone issues. See map for details.

South Kalispell District Fire Chief Comments (Priority Area Review):

- *No need for fuel reduction. A lot of work has already been done.*

- *Egress issues and need for water. If FEMA money is available, a well with a pump would be ideal for a fill site.*

Smith Valley Fire District 35,449 Acres
Priority Areas 1,365 Acres

- Priority Area Number 1 – Upper Batavia = 524 Acres
- 188 Parcels with buildings
- Low/high $460 - $1,057,790
- Average building value = $109,721

- Priority Area Number 2 – Hoffman Draw = 135 Acres
- 102 Parcels with buildings
- Low/high $19,008 – $64,254
- Average building value = $37,383

- Priority Area Number 3- Rogers Lake = 43 Acres
- 53 Parcels with buildings
- Low/high $1,570 – $228,500
- Average building value = $110,277

- Priority Area Number 4- Browns Meadow = 142 Acres
- 67 Parcels with buildings
- Low/high $2,060 – $253,880
- Average building value = $105,385

- Priority Area Number 5 – Coons Hollow–Emmons Canyon–Truman Creek = 202 Acres
- 191 Parcels with buildings
- Low/high $820 – $344,620
- Average building value = $88,484

- Priority Area Number 6 – Spring Hill = 115 Acres
- 41 Parcels with buildings
- Low/high $1,360 – $200,260
- Average building value = $85,829

- Priority Area Number 7 - Haywire = 80 Acres
- 59 Parcels with buildings
- Low/high $830 – $170,100
- Average building value = $67,148

- Priority Area Number 8 – Foys Canyon = 64 Acres
- 124 Parcels with buildings
- Low/high $2,950 – $613,140

- Average building value = $172,954

- Priority Area Number 9 – Valley View = 61 Acres
- 29 Parcels with buildings
- Low/high $51,650 – $787,660
- Average building value = $242,476

Smith Valley District Fire Chief Comments (Priority Area Review):

1) ***Upper Batavia:***
   Most roads are narrow and grown over, and steep. Ingress/egress is poor. Very high interface area - major BPA line in area.

2) ***Hoffman Draw:***
   Most roads are narrow and grown over, and steep. Ingress/egress is poor. Very high interface area - major BPA line in area. Poor addressing of homes, travel times are getting longer.

3) ***Haywire:***
   Very high density of fuel types, ingress, egress- no water supply

4) ***Valley View:***
   Fuel types, slope, ingress/egress

5) ***Foy's Canyon:***
   Poor ingress / egress in areas, slope, water supply.

6) ***Rogers Lake:***
   High housing density, most are vulnerable, lots of beetle kill

7) ***Spring Hill:***
   Density, slope, poor ingress, egress, thick mistle toe in areas, no water supply

8) ***Browns Meadow:***
   High housing density, longer travel time, poor area for water supply

9) ***Coon Hollow:***
   High density, long travel times, limited water supply, access: one way in, one way out, steep slopes.

10) ***Emmons Canyon:***
    Same as Coon Hollow

11) ***Truman Creek:***
    Same as Coon Hollow

Somers / Lakeside 27,474 Acres
Priority Areas 1,711 Acres

- Priority Area Number 1 – Angel Point = 1,206 Acres
- 140 Parcels with buildings
- Low/high $412 – $1,518,580
- Average building value = $178,720

- Priority Area Number 2 – Blacktail = 506 Acres
- 90 Parcels with buildings
- Low/high $22,960 – $519,760
- Average building value = $122,769

Somers-Lakeside District Fire Chief Comments (Priority Area Review):

1) ***Angel Point:***
   Mixed ownership, need to remove fuel along main Angle Pt. Road, Overall need for fuel reduction, one way in, one way out. Access, slopes, gullies, need a safety zone at Whipps Lane. Only a few homes are Firewise.[30]

2) ***Blacktail:***
   Subdivisions, home density, needs fuel reduction, some work done…needs more.

West Valley Fire District 43,051 Acres
Priority Areas 8,414 Acres

- Priority Area Number 1 = 7,635 Acres
- 42 Parcels with buildings
- Low/high $3,110 – $339,000
- Average building value = $96,204

- Priority Area Number 2 = 780 Acres
- 28 Parcels with buildings
- Low/high $52,710 – $295,530
- Average building value = $152,248

Whitefish Rural Fire District 50,139 Acres
Priority Areas 3,043 Acres

- Priority Area Number 1 – East Lakeshore of Whitefish Lake = 837 Acres

[30] Please see Angel Point photo number 8.

- 116 parcels with buildings
- Low/High $841 - $2,592,185
- Average building value $213,710

- Priority Area Number 2- Haskill Basin = 1191 Acres
- 89 Parcels with buildings
- Low/High $997 - $896,970
- Average building value $120,913

- Priority Area Number 3- Twin Lakes = 1015 Acres
- 37 Parcels with buildings
- Low/High $2,870 - $276,800
- Average building value $119,703

Figure 19
BADROCK PRIORITY AREAS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

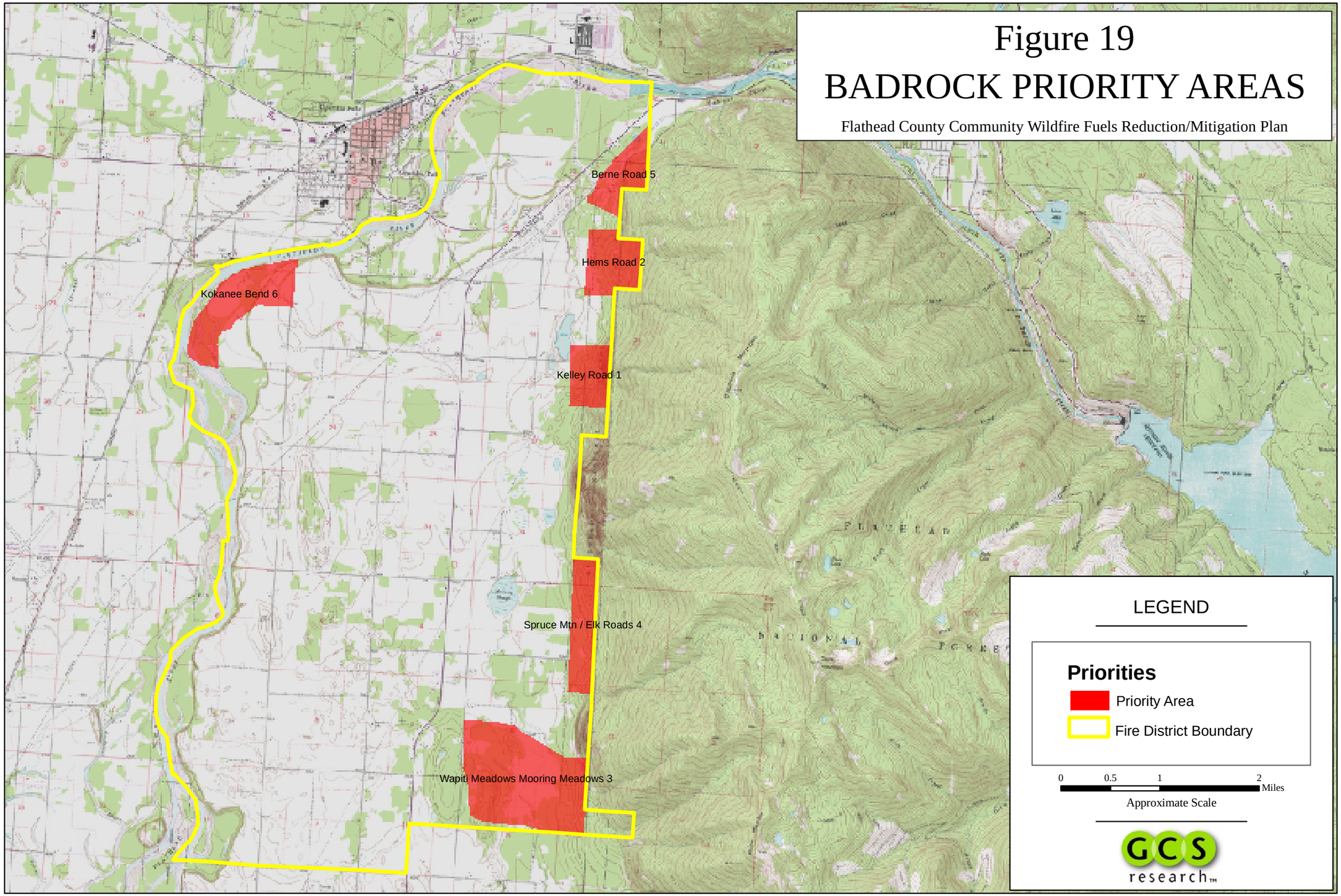

Figure 19: Badrock Priority Areas

Figure 20
BADROCK PARCELS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

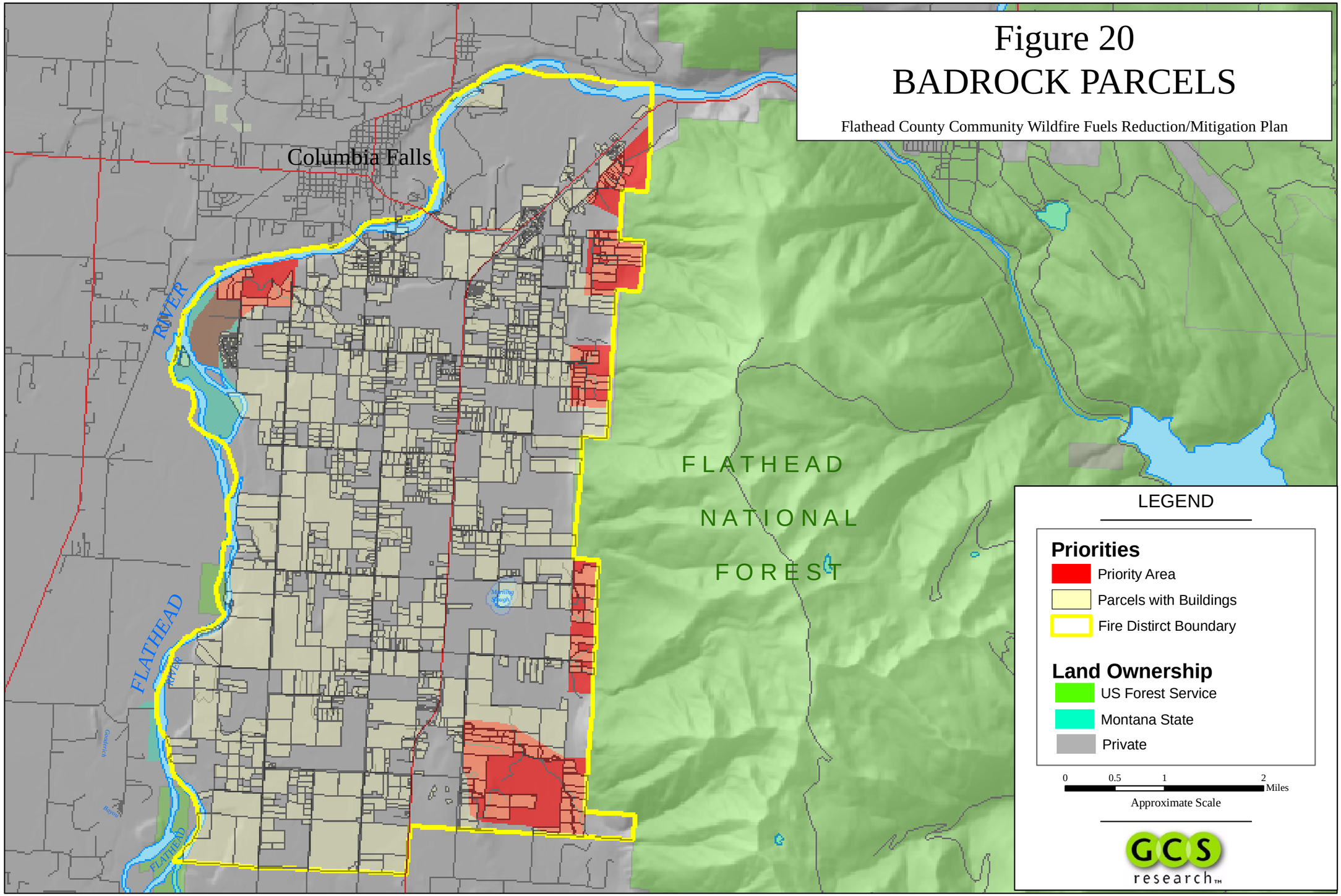

Figure 20: Badrock Parcels

Figure 21
BIG MOUNTAIN PRIORITIES

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

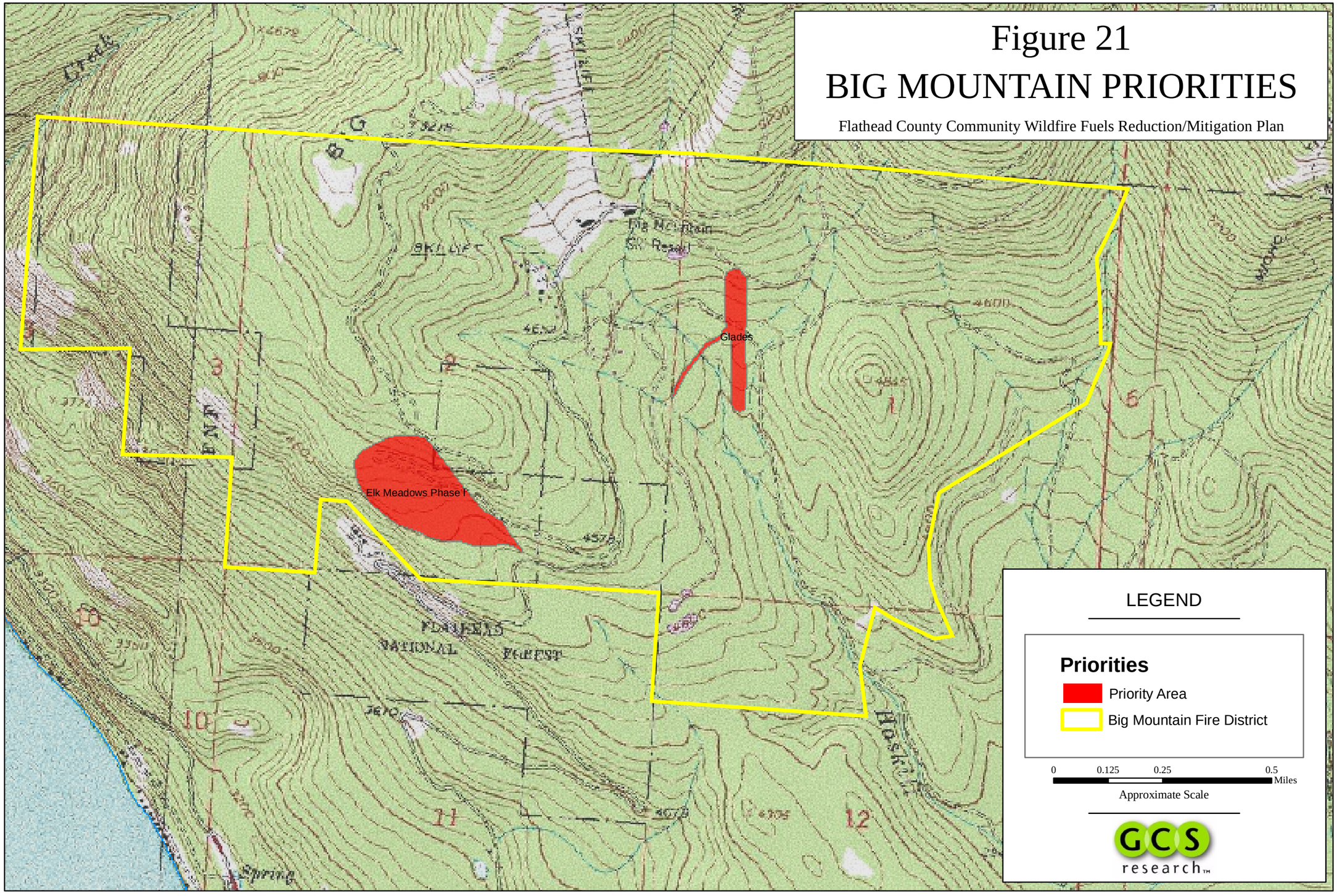

Figure 21: Big Mountain Priorities

Figure 22
BIG MOUNTAIN PARCELS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

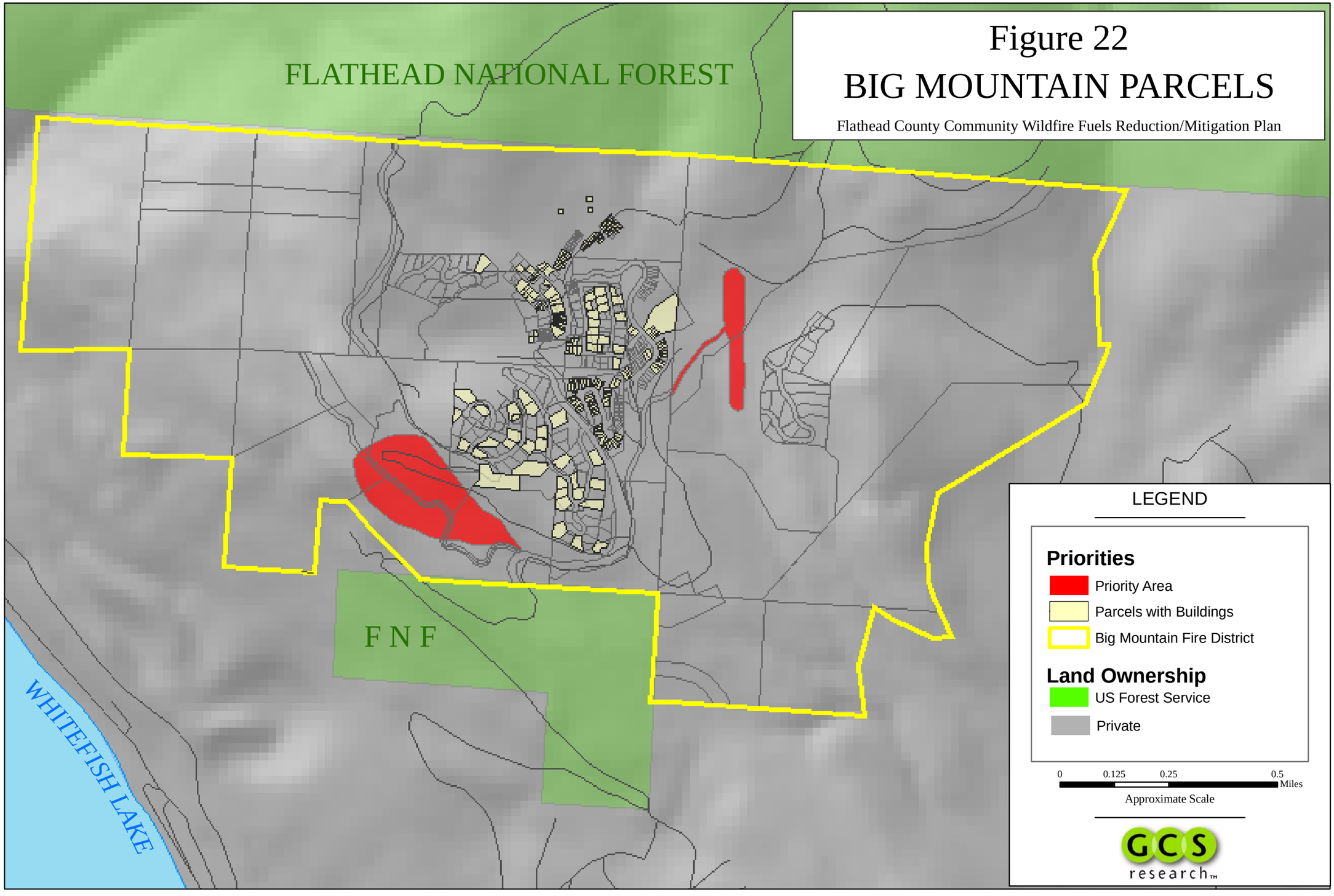

Figure 22: Big Mountain Parcels

Figure 23

BIGFORK PRIORITY AREAS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

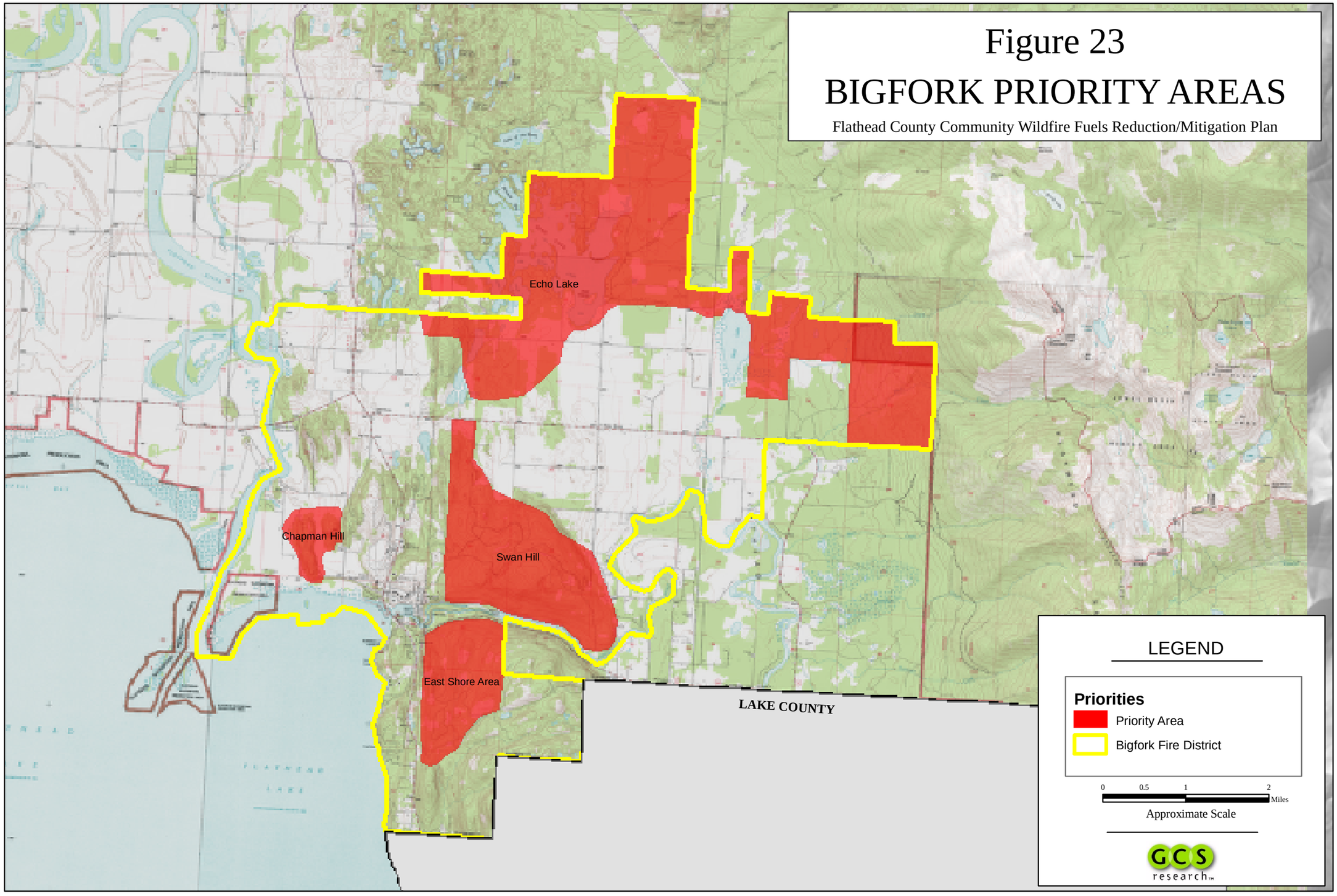

Figure 23: Bigfork Priority Areas

Figure 24

BIGFORK PARCELS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

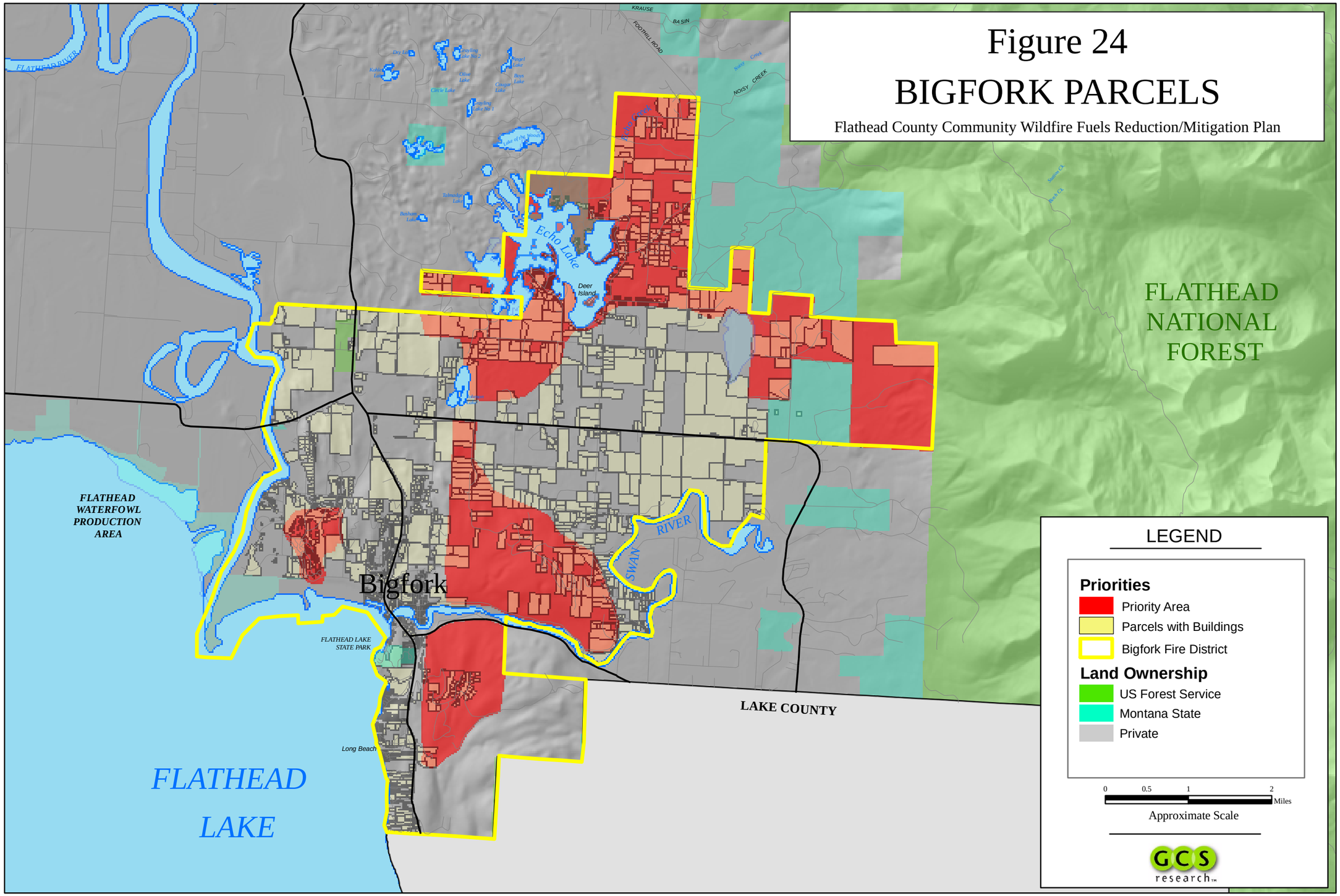

Figure 24: Bigfork Parcels

Figure 25
BLANKENSHIP PRIORITIES

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

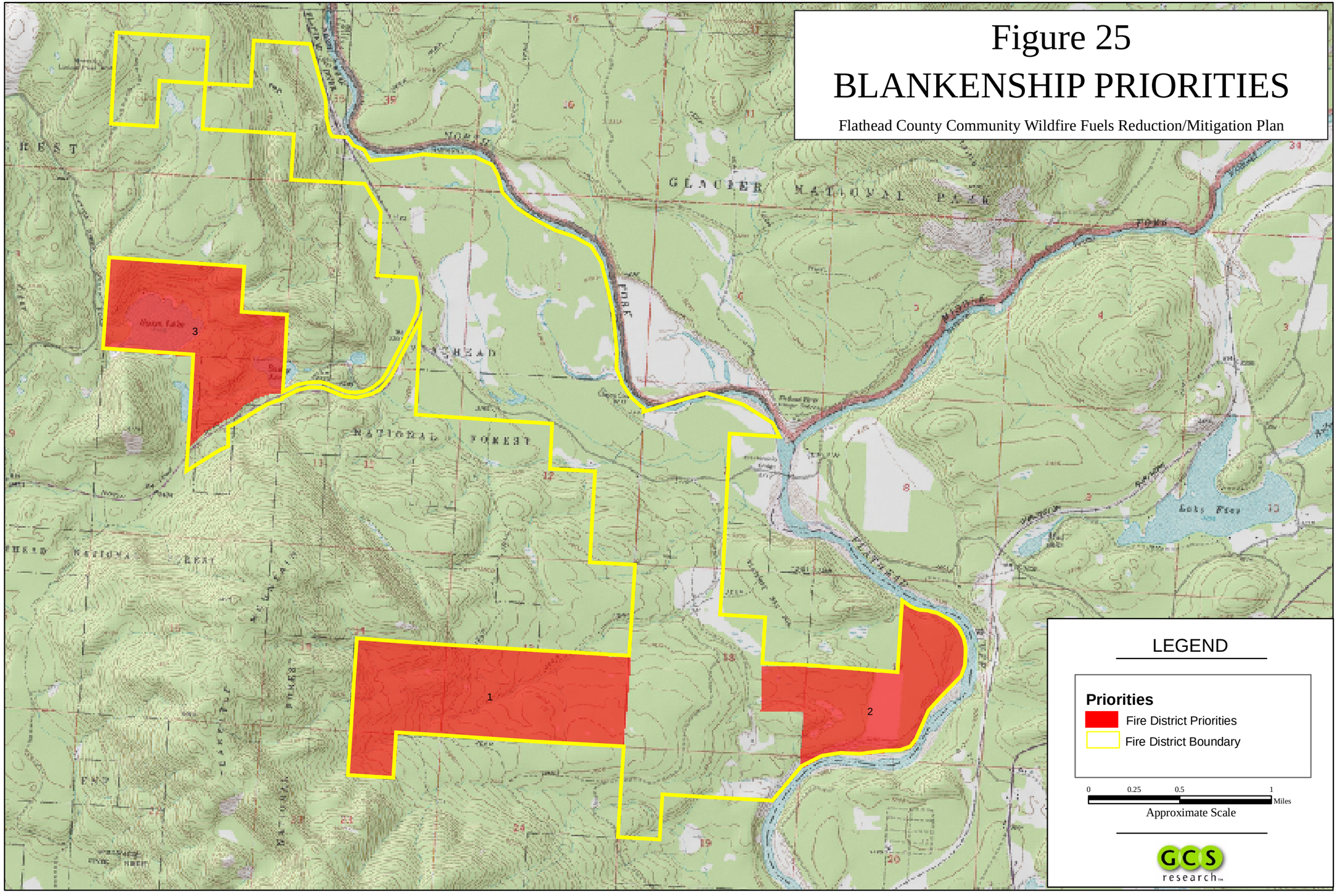

Figure 25: Blankenship Priorities

Figure 26
BLANKENSHIP PARCELS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

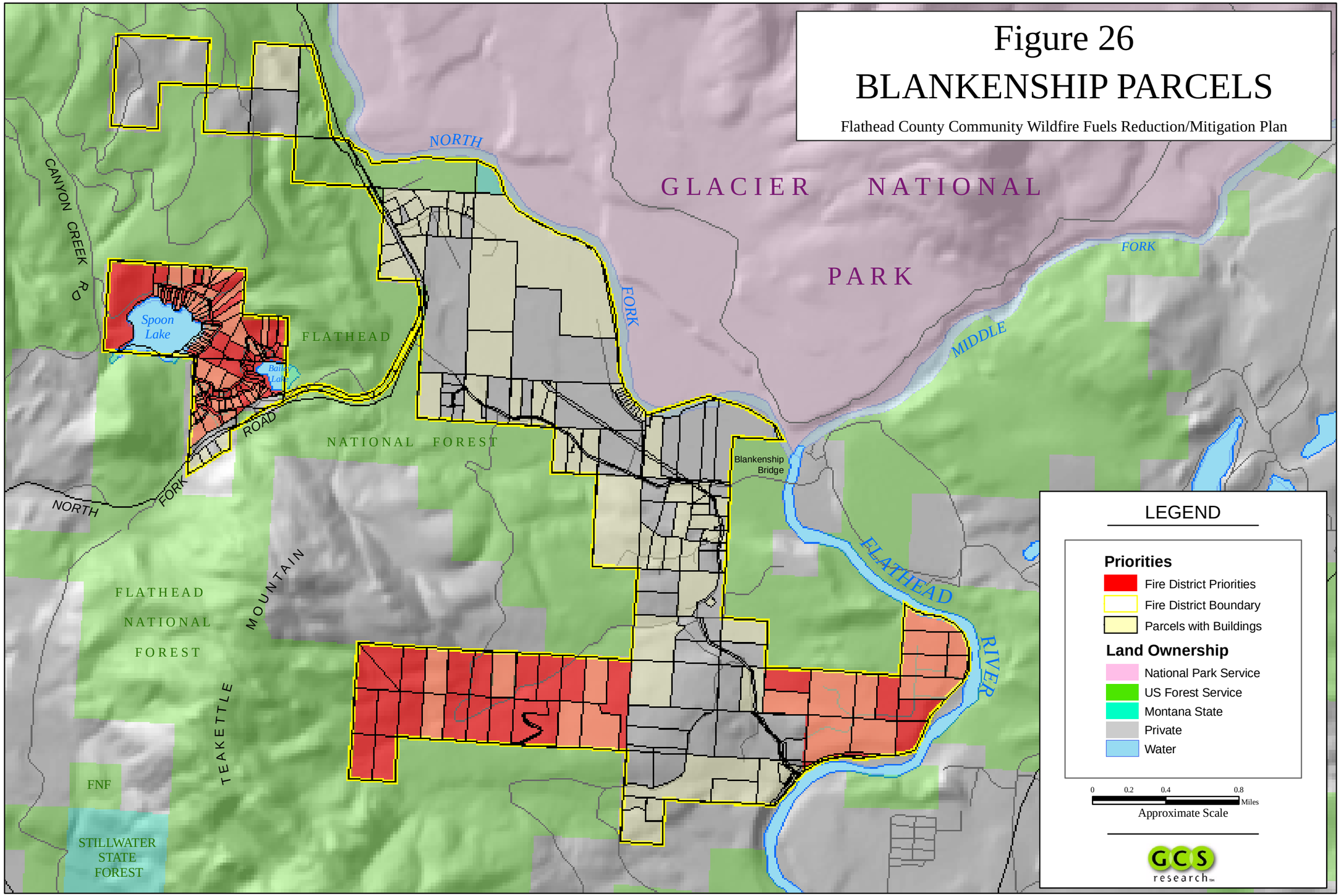

Figure 26: Blankenship Parcels

Figure 27

COLUMBIA FALLS RURAL PRIORITIES

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

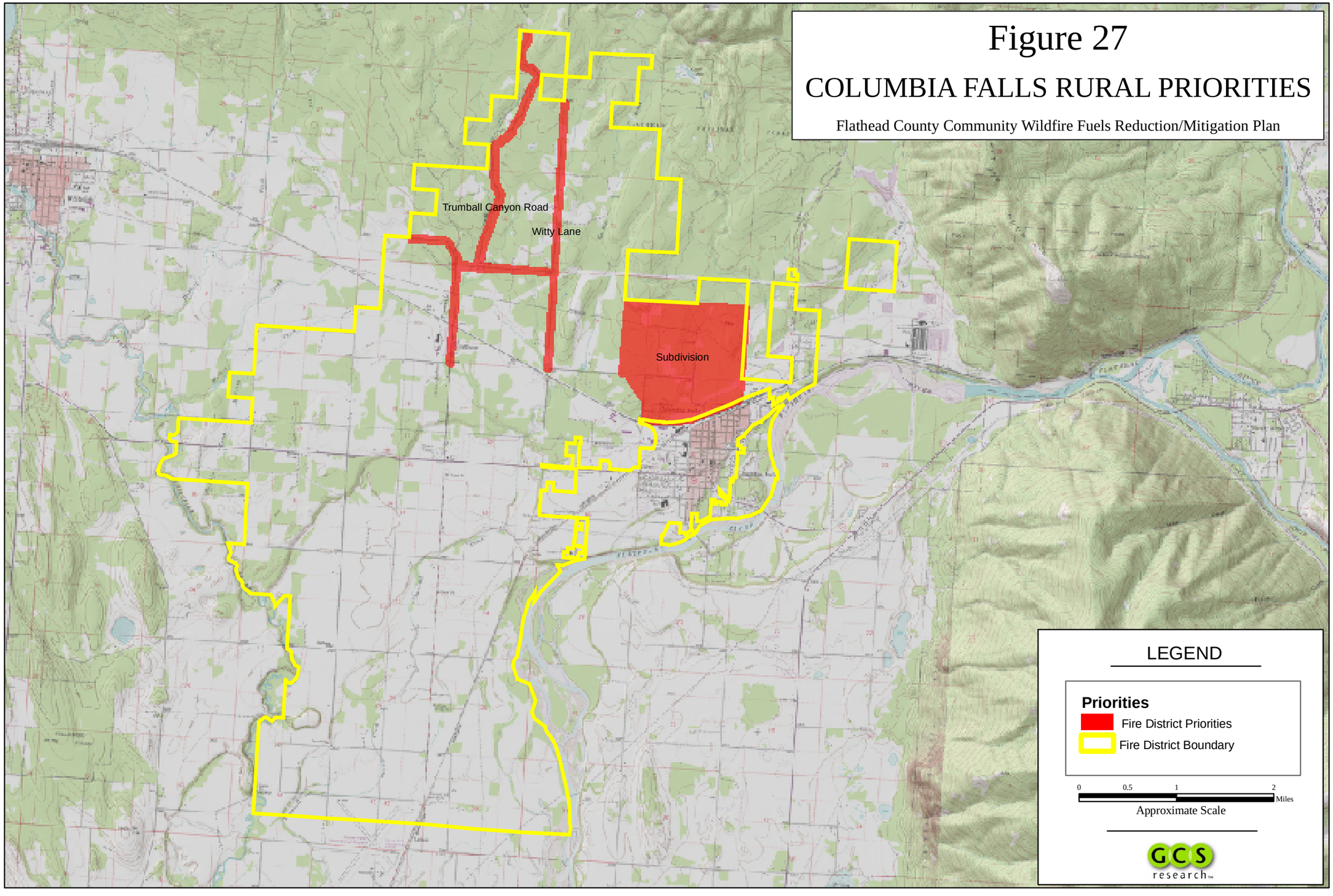

Figure 27: Columbia Falls Rural Priorities

Figure 28

COLUMBIA FALLS RURAL PARCELS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

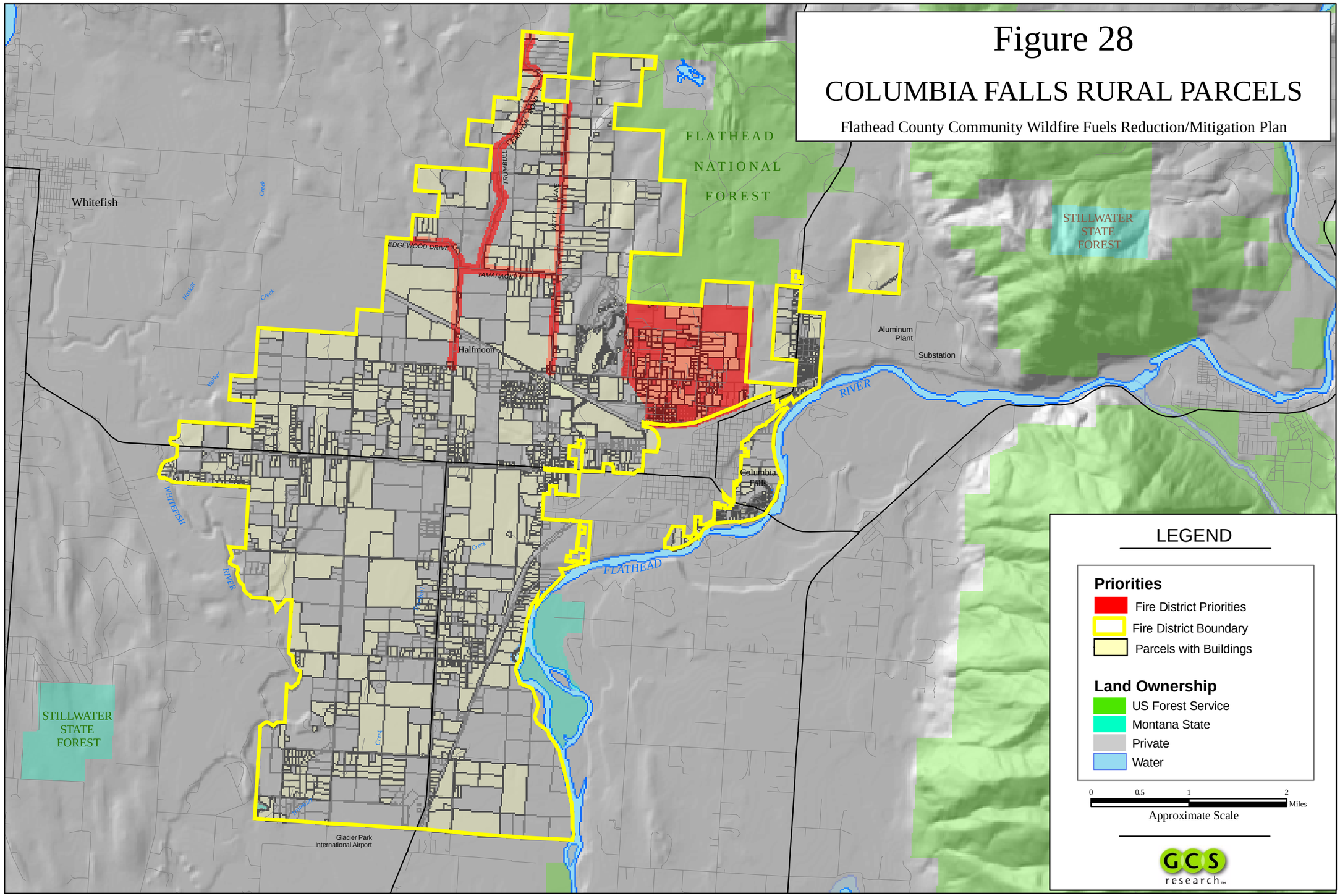

Figure 28: Columbia Falls Rural Parcels

Figure 29

CORAM / WEST GLACIER PRIORITIES

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

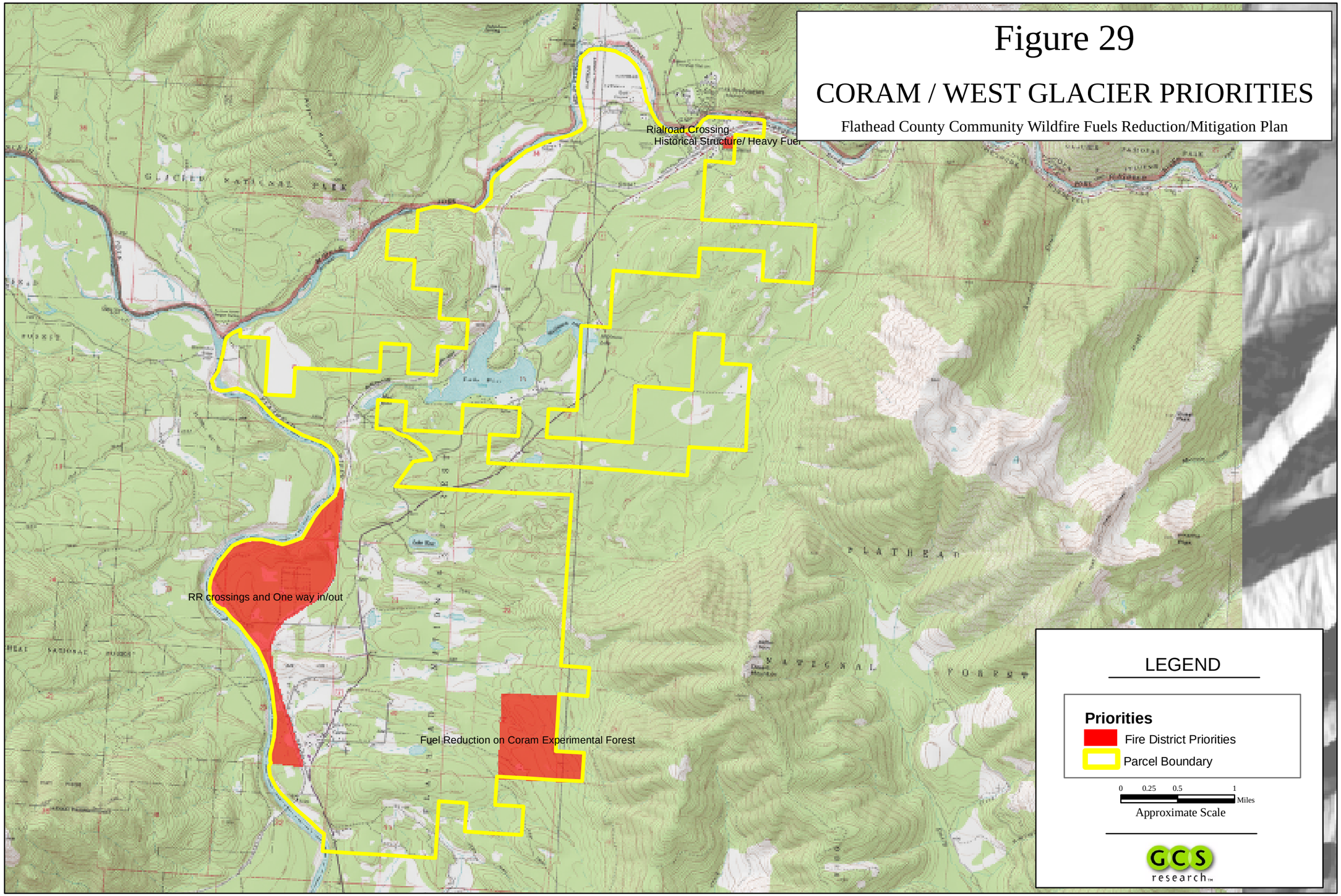

Figure 29: Coram / West Glacier Priority Areas

Figure 30

CORAM / WEST GLACIER PARCELS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

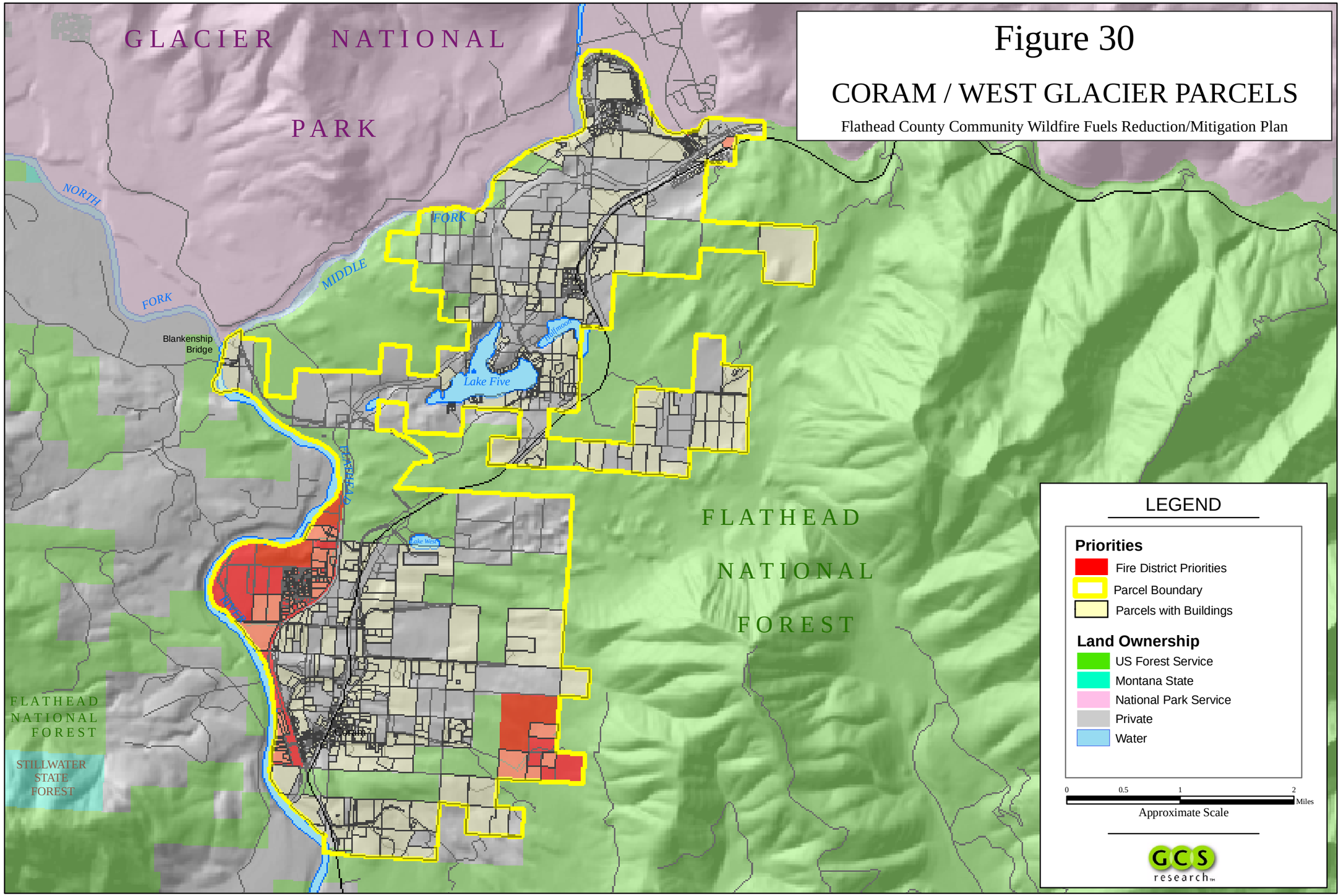

Figure 30: Coram / West Glacier Parcels

Figure 31
CRESTON PRIORITY AREAS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

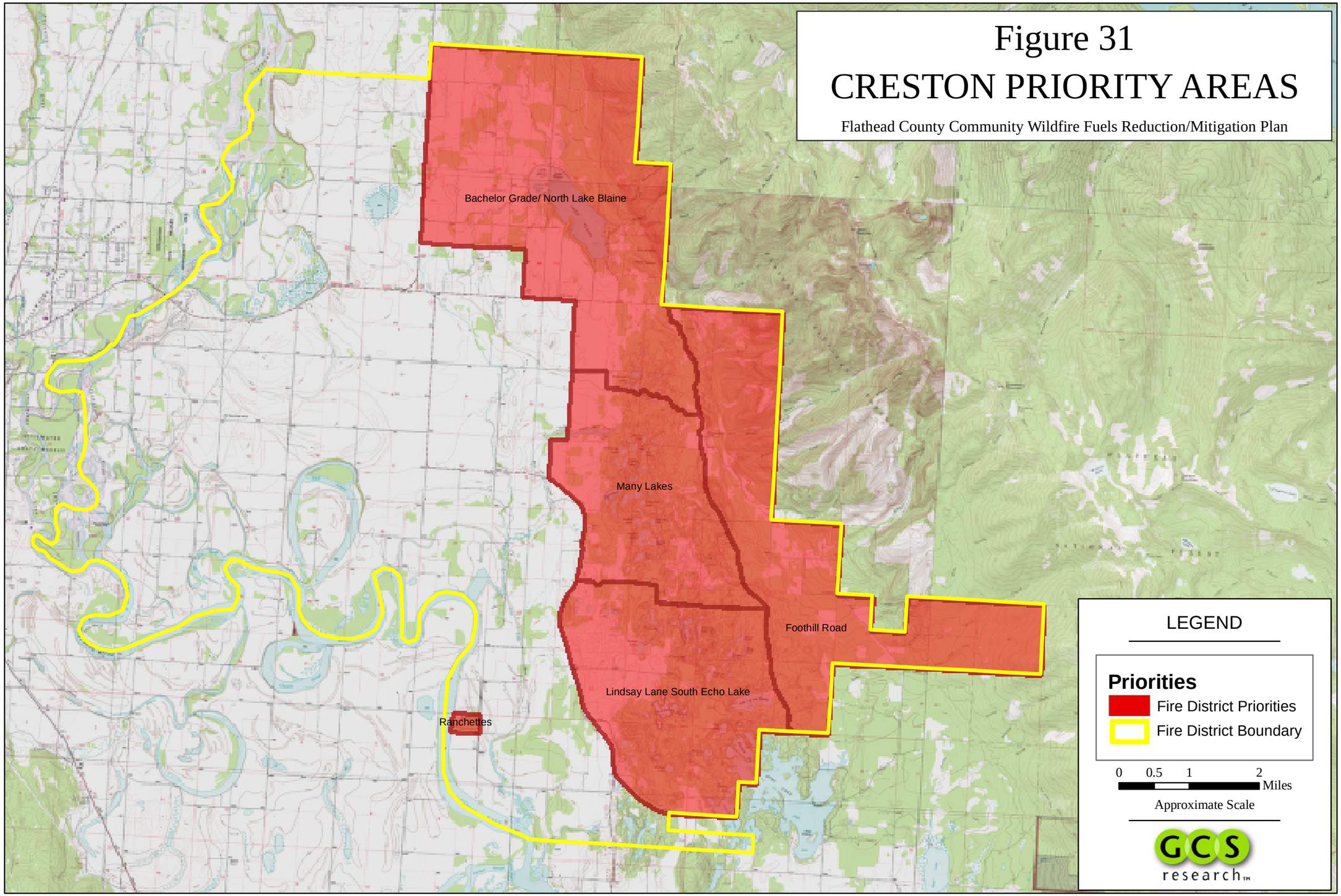

Figure 31: Creston Priority Areas

Figure 32
CRESTON PARCELS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

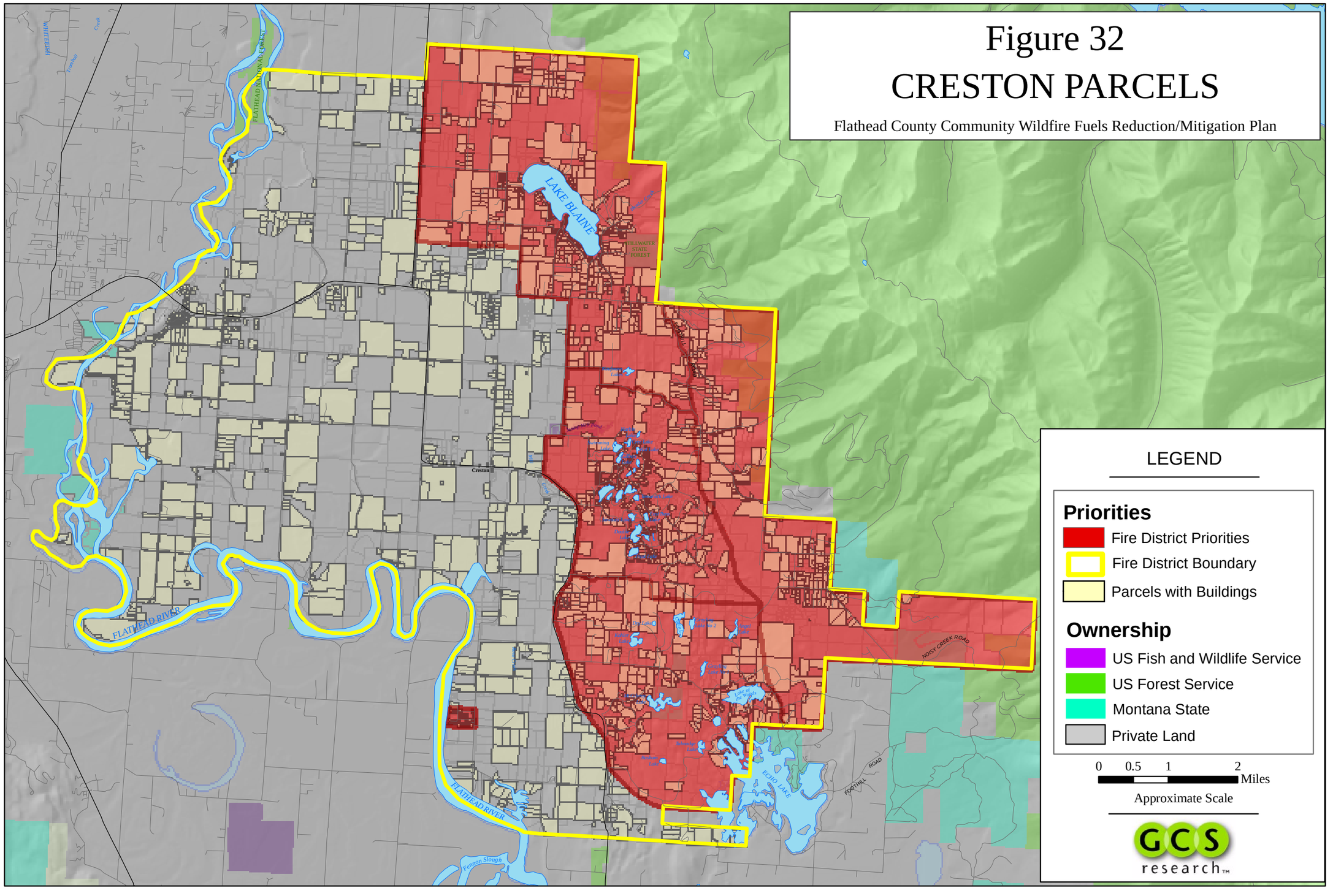

Figure 32: Creston Parcels

Figure 33
EVERGREEN PRIORITY AREAS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

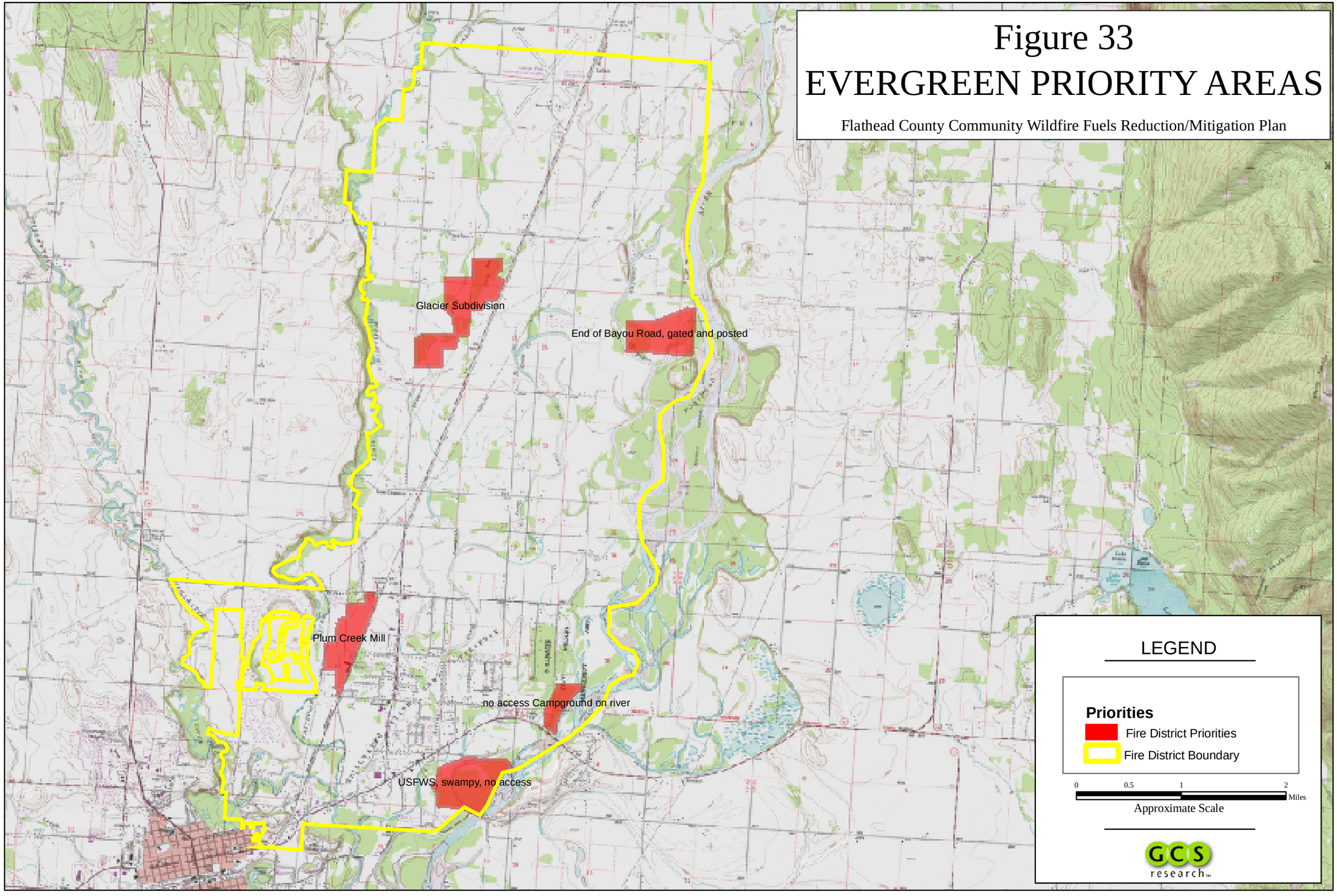

Figure 33: Evergreen Priority Areas

Figure 34

EVERGREEN PARCELS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

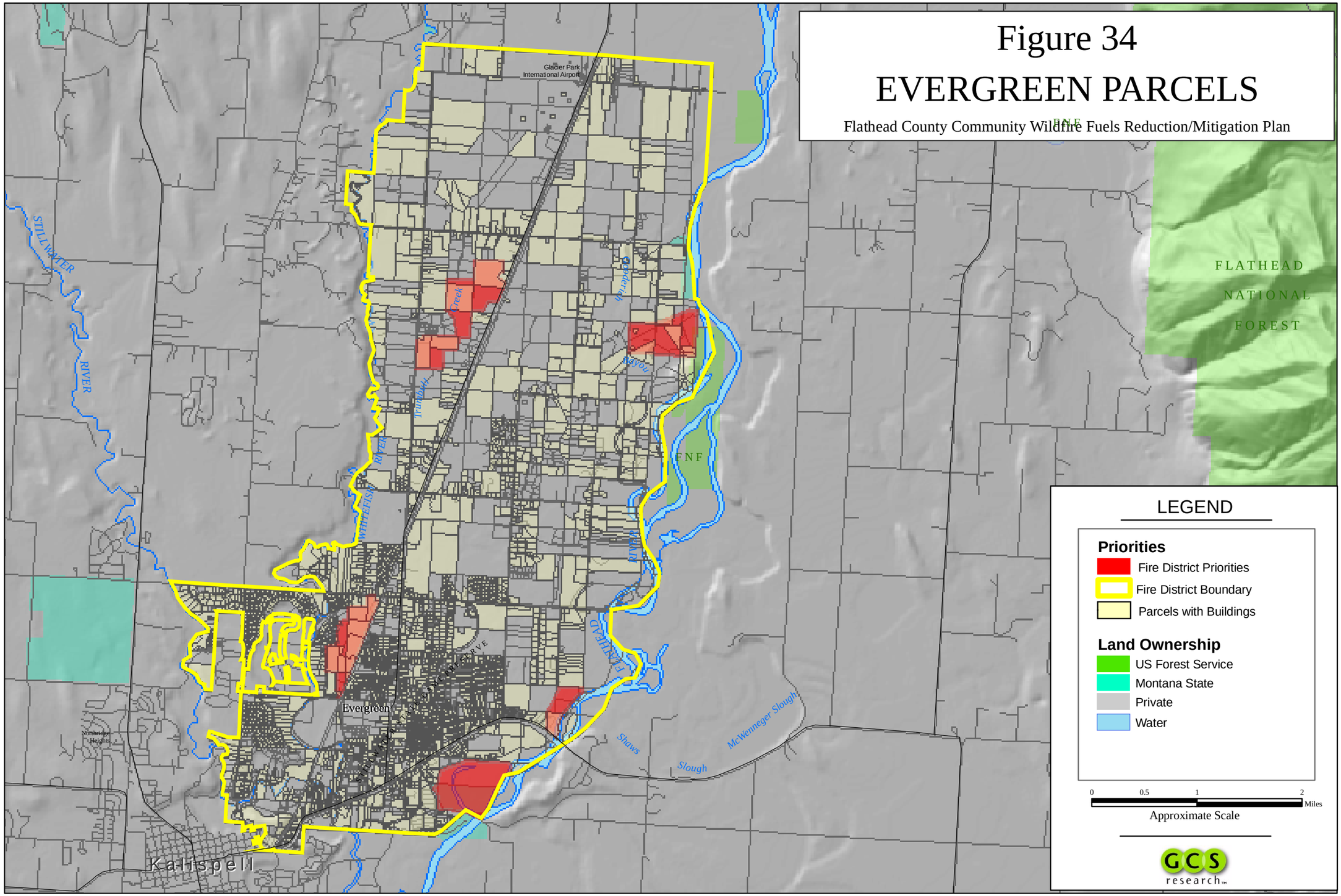

Figure 34: Evergreen Parcels

Figure 35
FERNDALE PRIORITY AREAS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

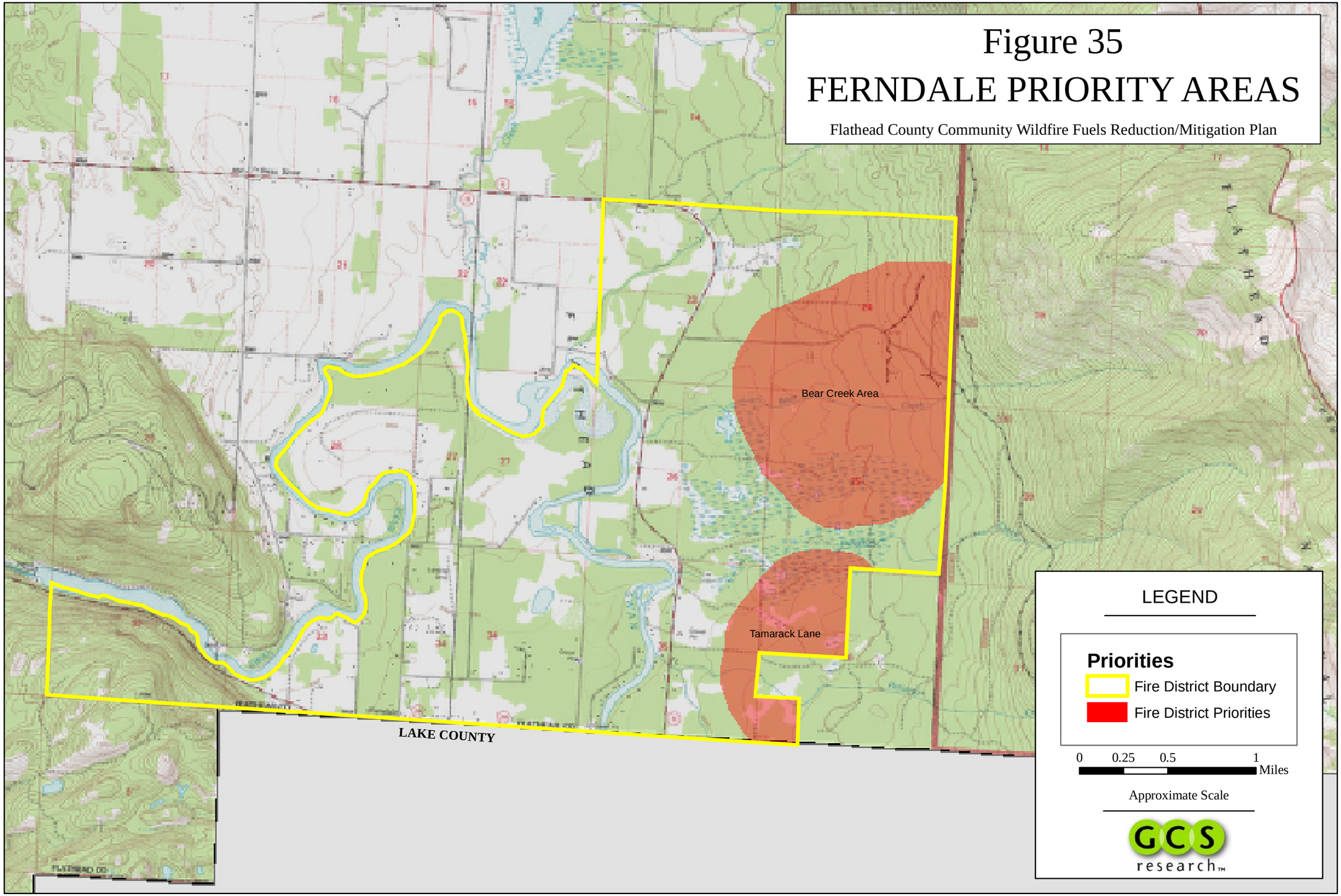

Figure 35: Ferndale Priority Areas

Figure 36
FERNDALE PARCELS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

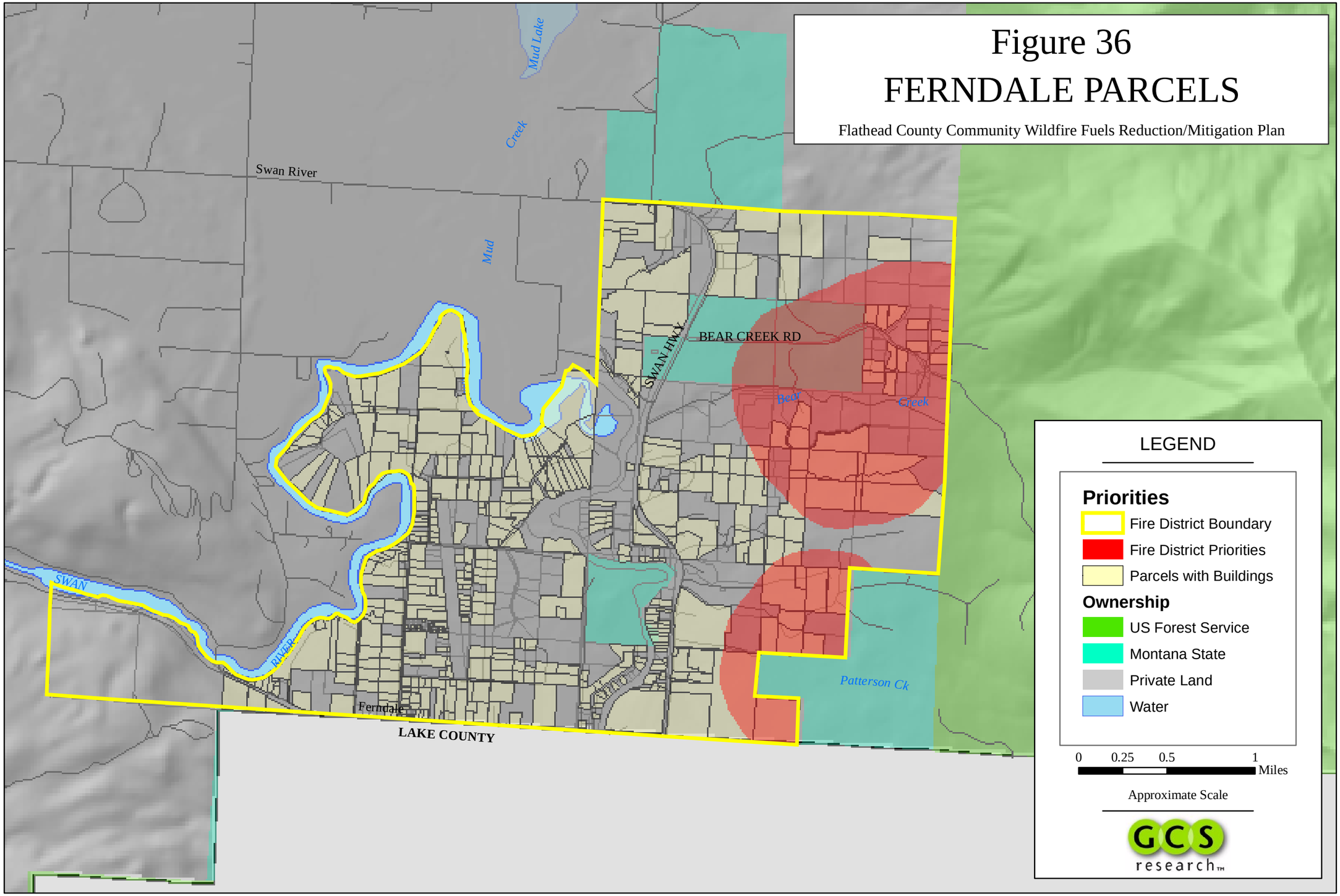

Figure 36: Ferndale Parcels

Figure 37

HUNGRY HORSE PRIORITY AREAS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

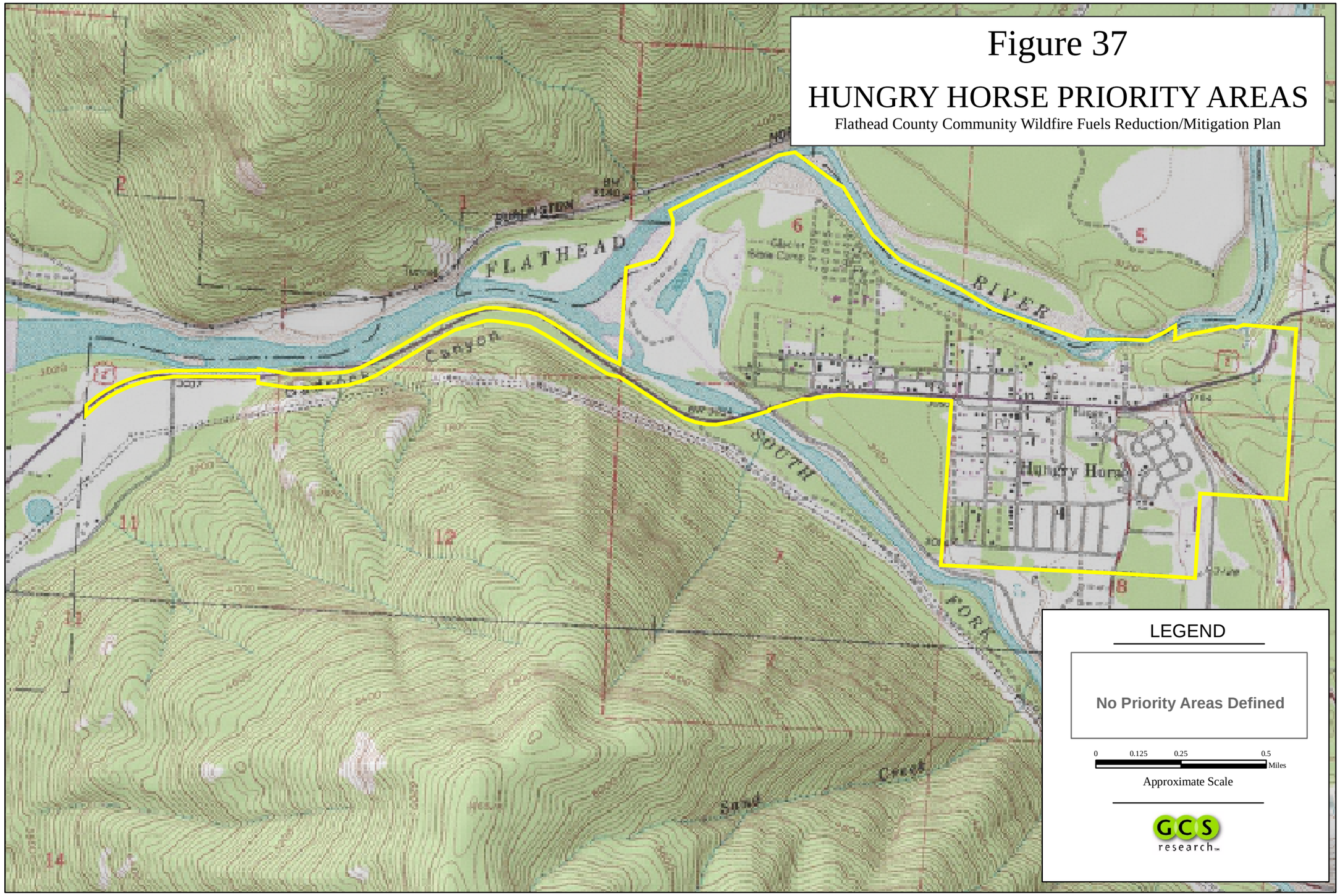

Figure 37: Hungry Horse Priority Areas

Figure 38

HUNGRY HORSE PARCELS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

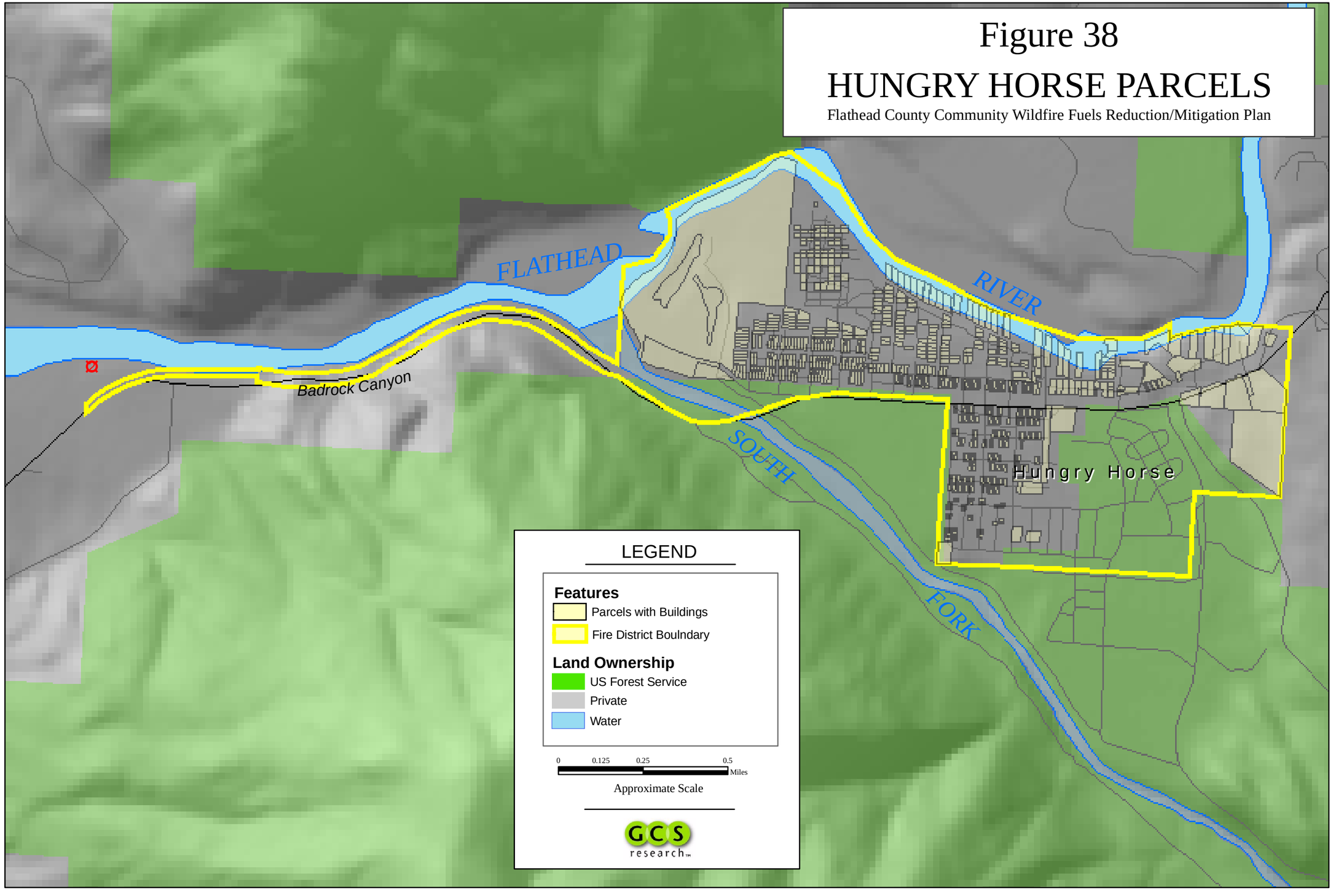

Figure 38: Hungry Horse Parcels

Figure 39

KALISPELL CITY PRIORITY AREAS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

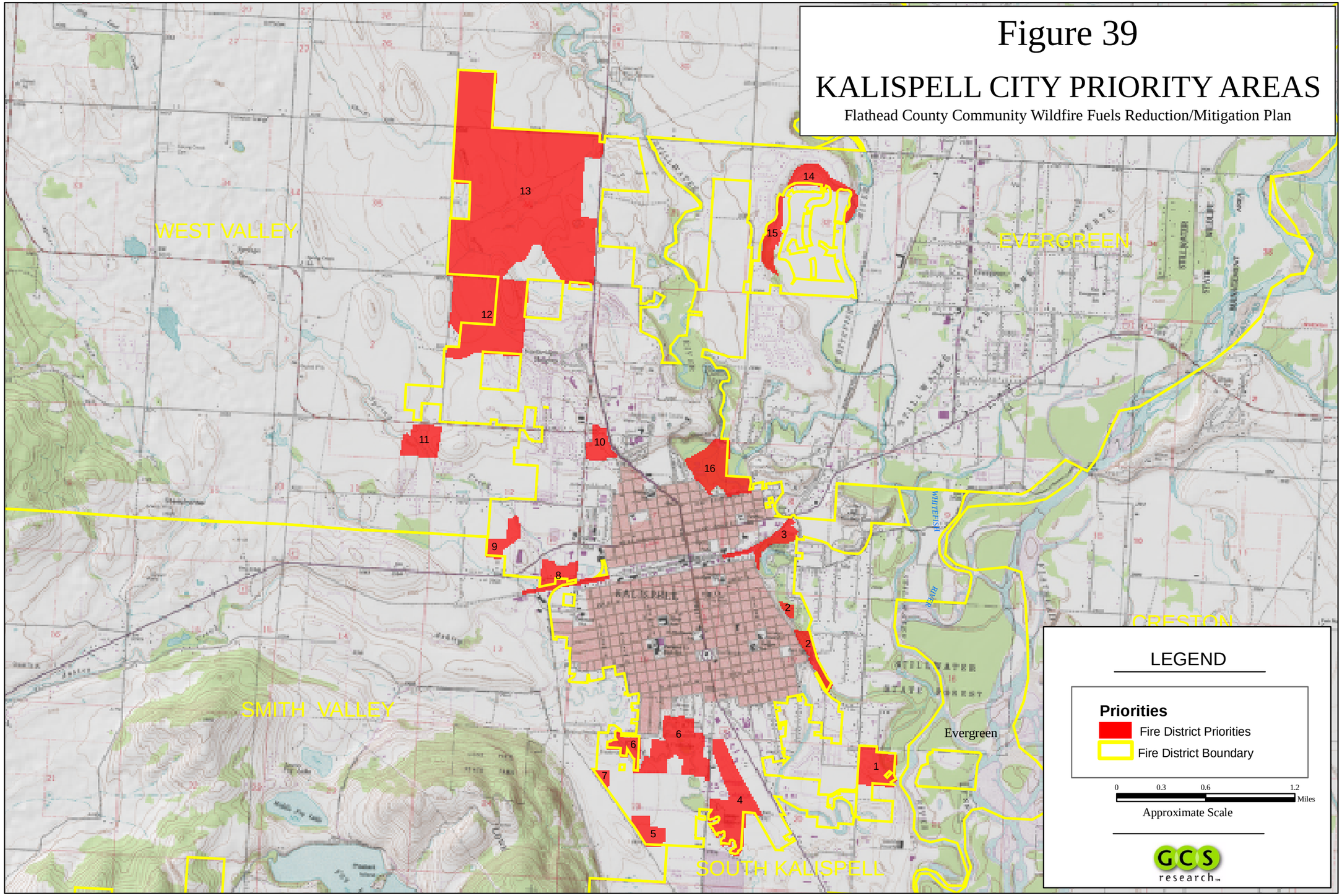

Figure 39: Kalispell City Priority Areas

Figure 40
KALISPELL CITY PARCELS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

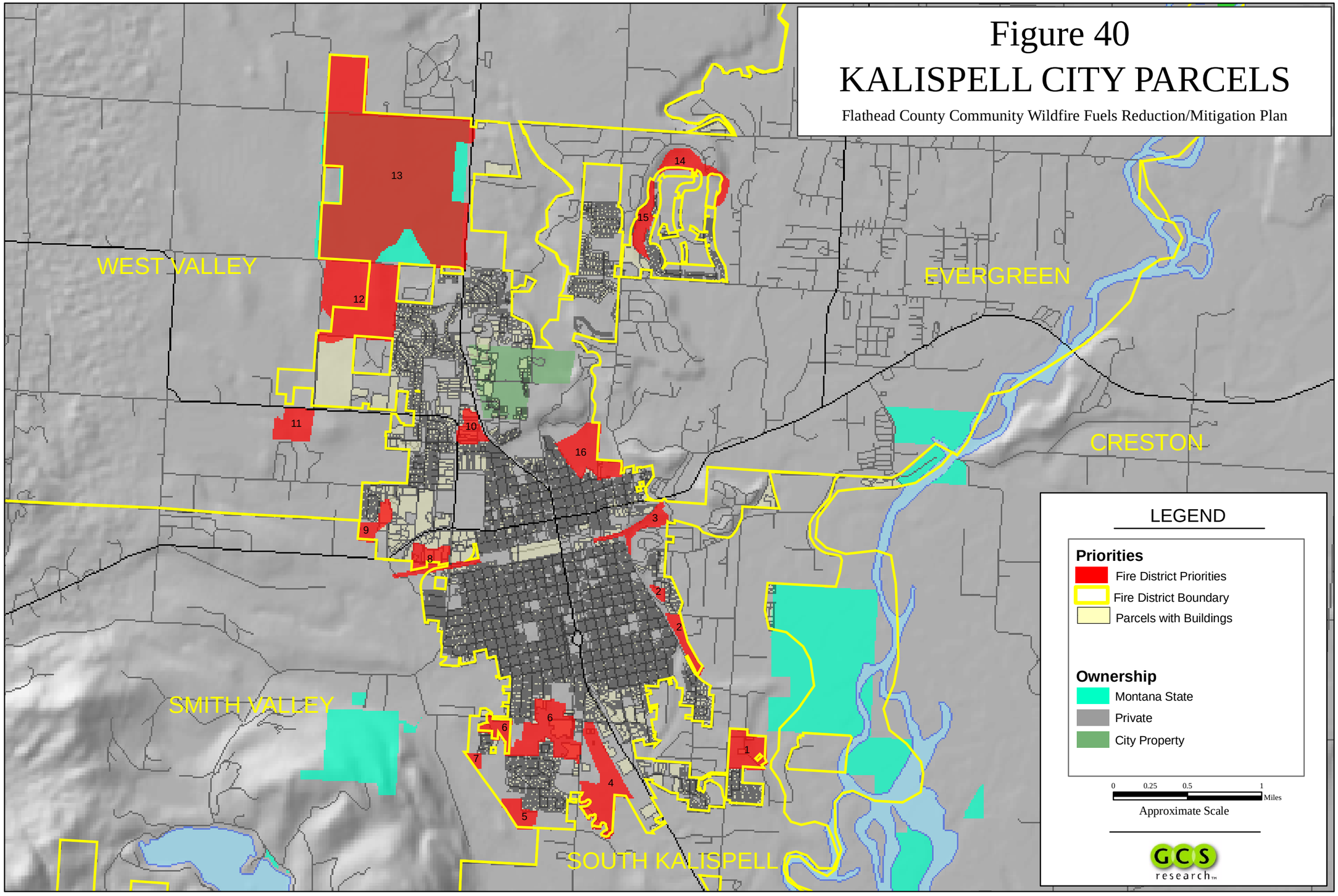

Figure 40: Kalispell City Parcels

Figure 41

MARION PRIORITY AREAS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

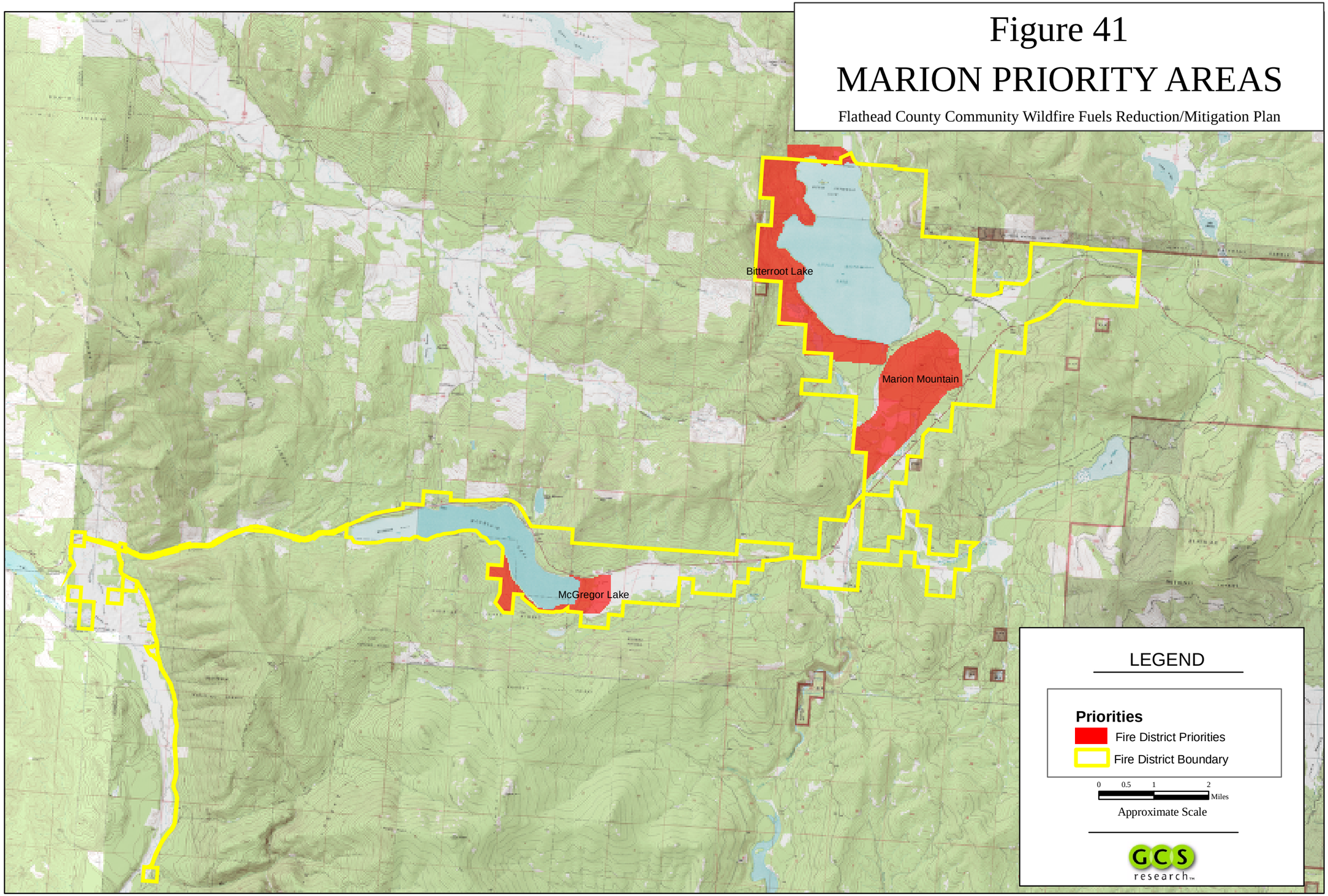

Figure 41: Marion Priority Areas

Figure 42

MARION PARCELS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

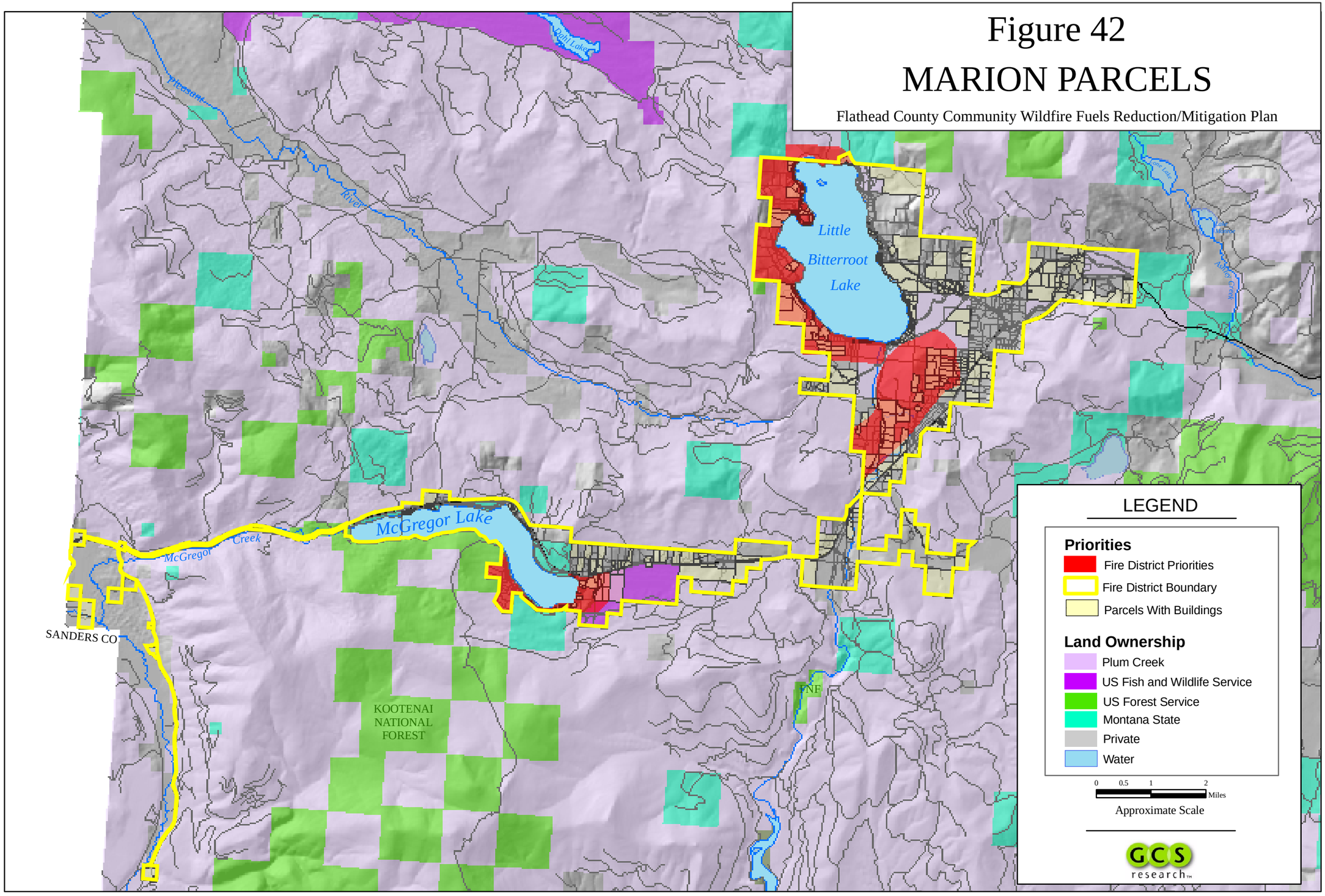

Figure 42: Marion Parcels

Figure 43

MARTIN CITY PRIORITY AREAS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

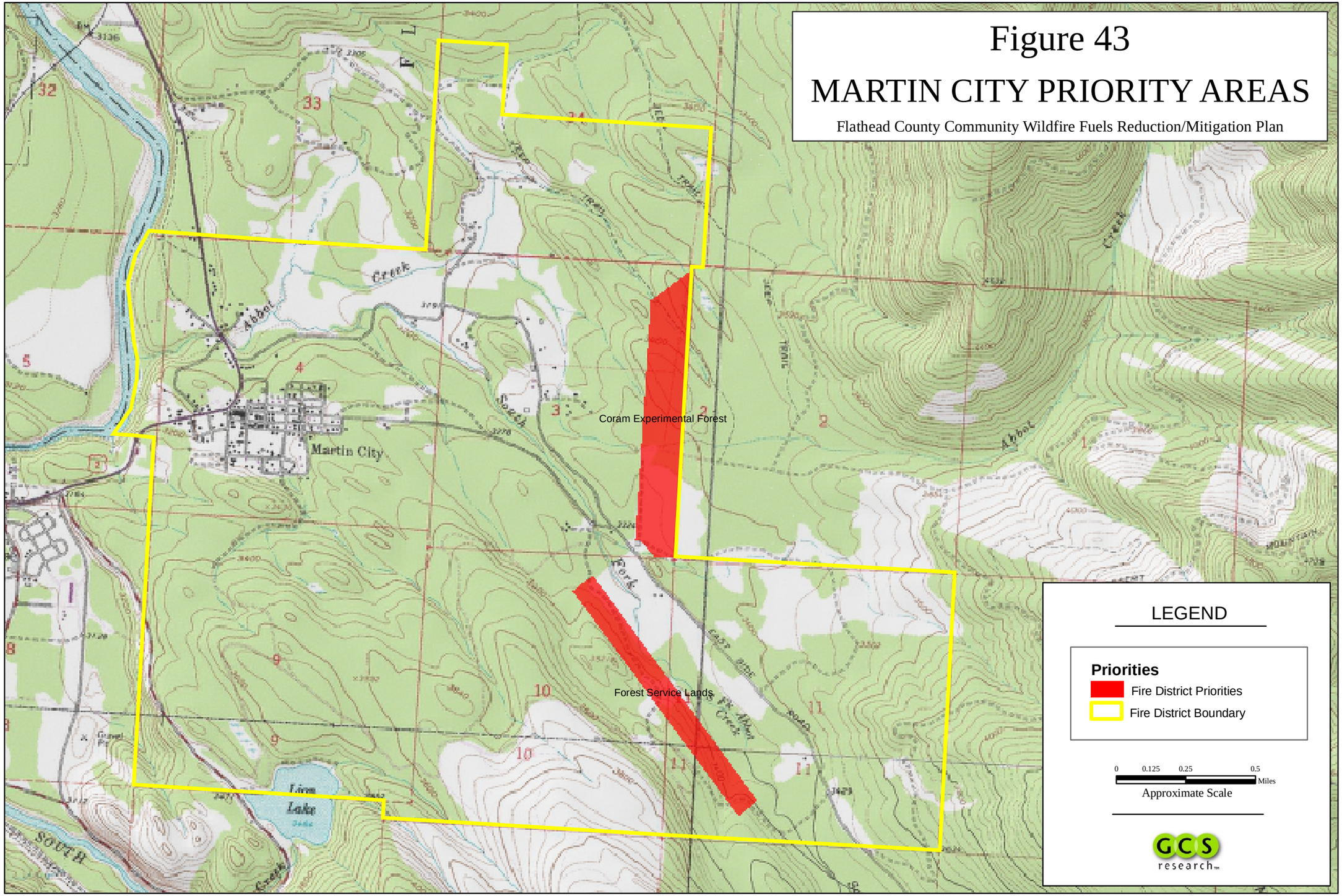

Figure 43: Martin City Priority Areas

Figure 44

MARTIN CITY PARCELS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

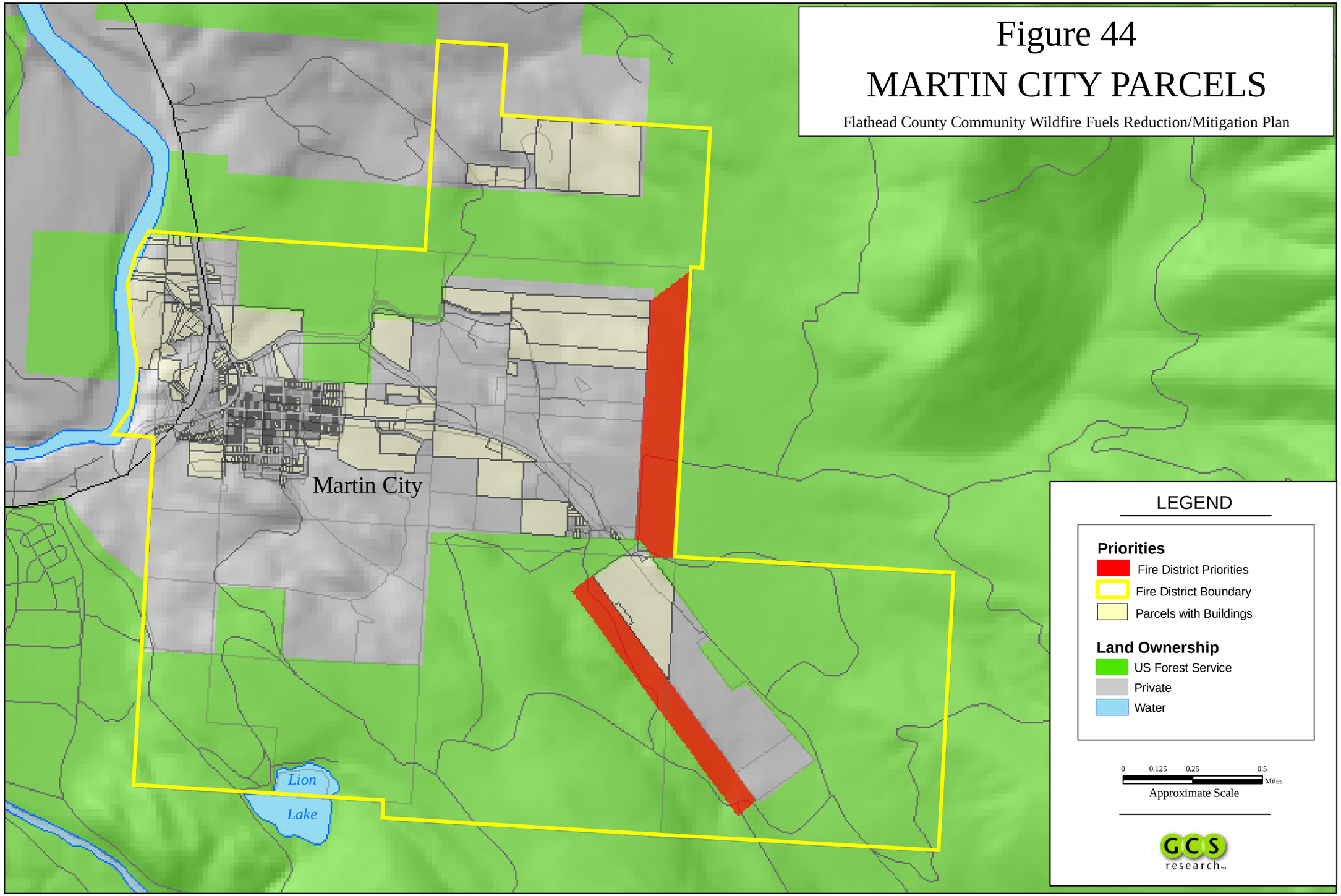

Figure 44: Martin City Parcels

Figure 45

OLNEY PRIORITY AREAS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

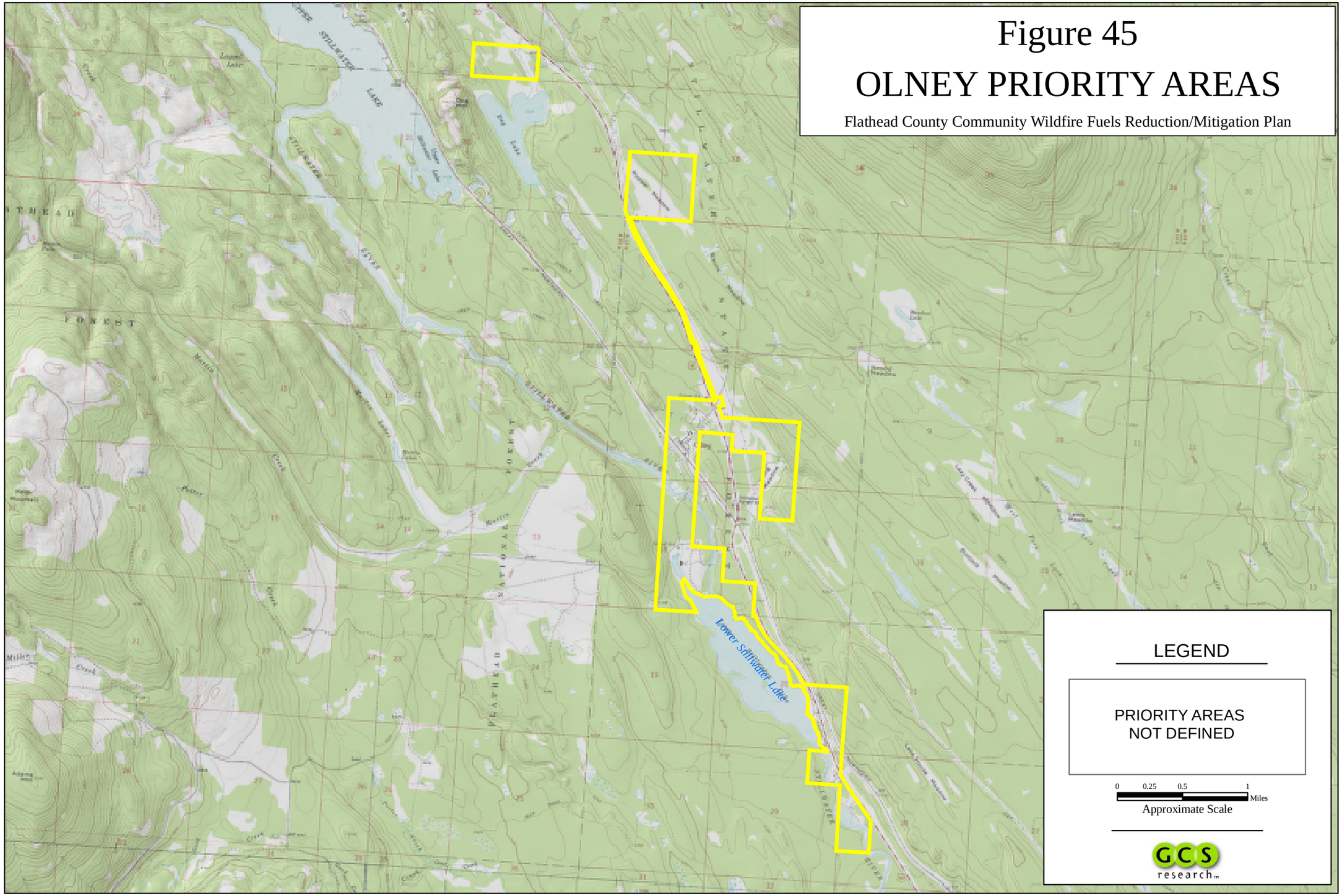

Figure 45: Olney Priority Areas

Figure 46

OLNEY PARCELS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

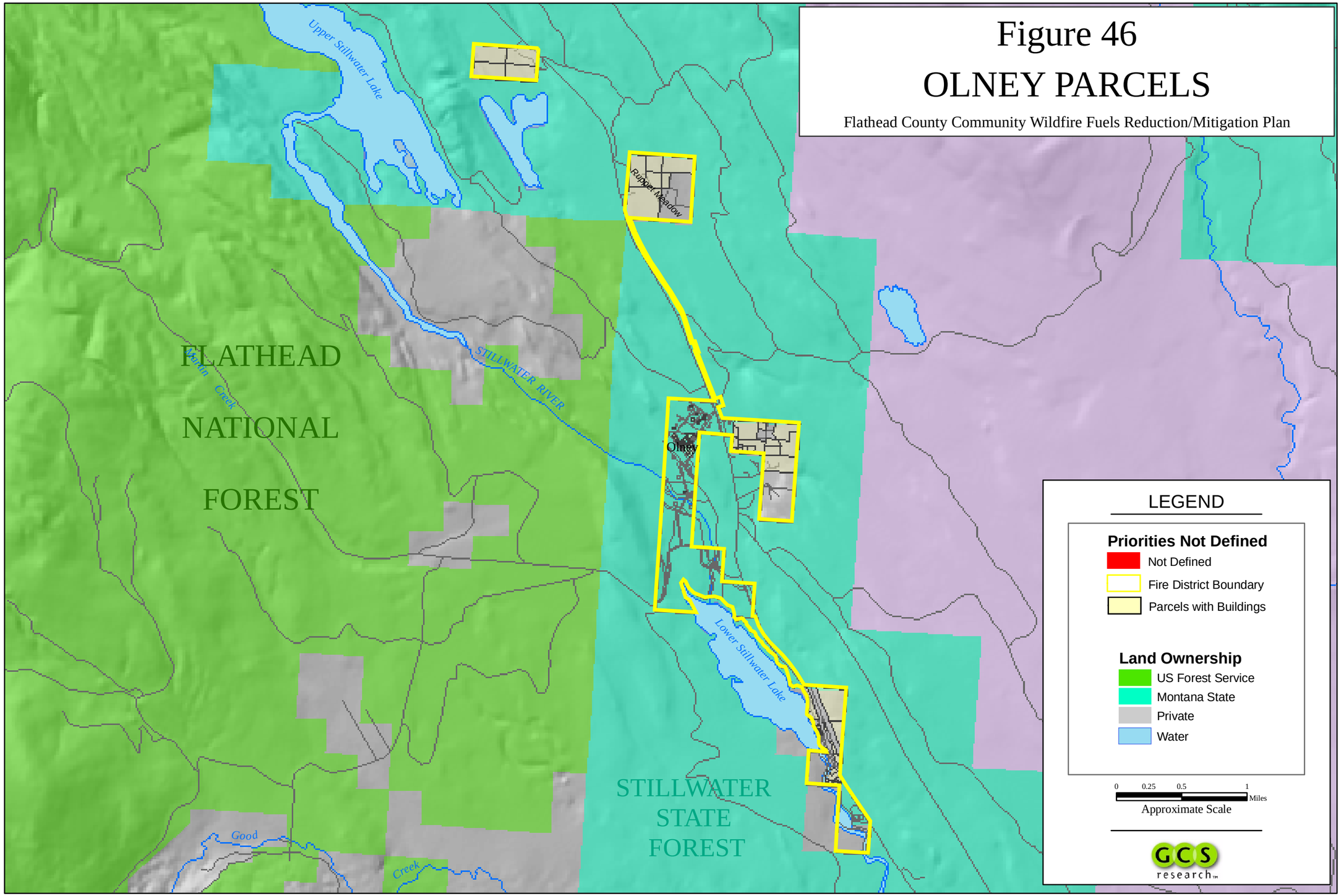

Figure 46: Olney Parcels

Figure 47

SOUTH KALISPELL PRIORITY AREAS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

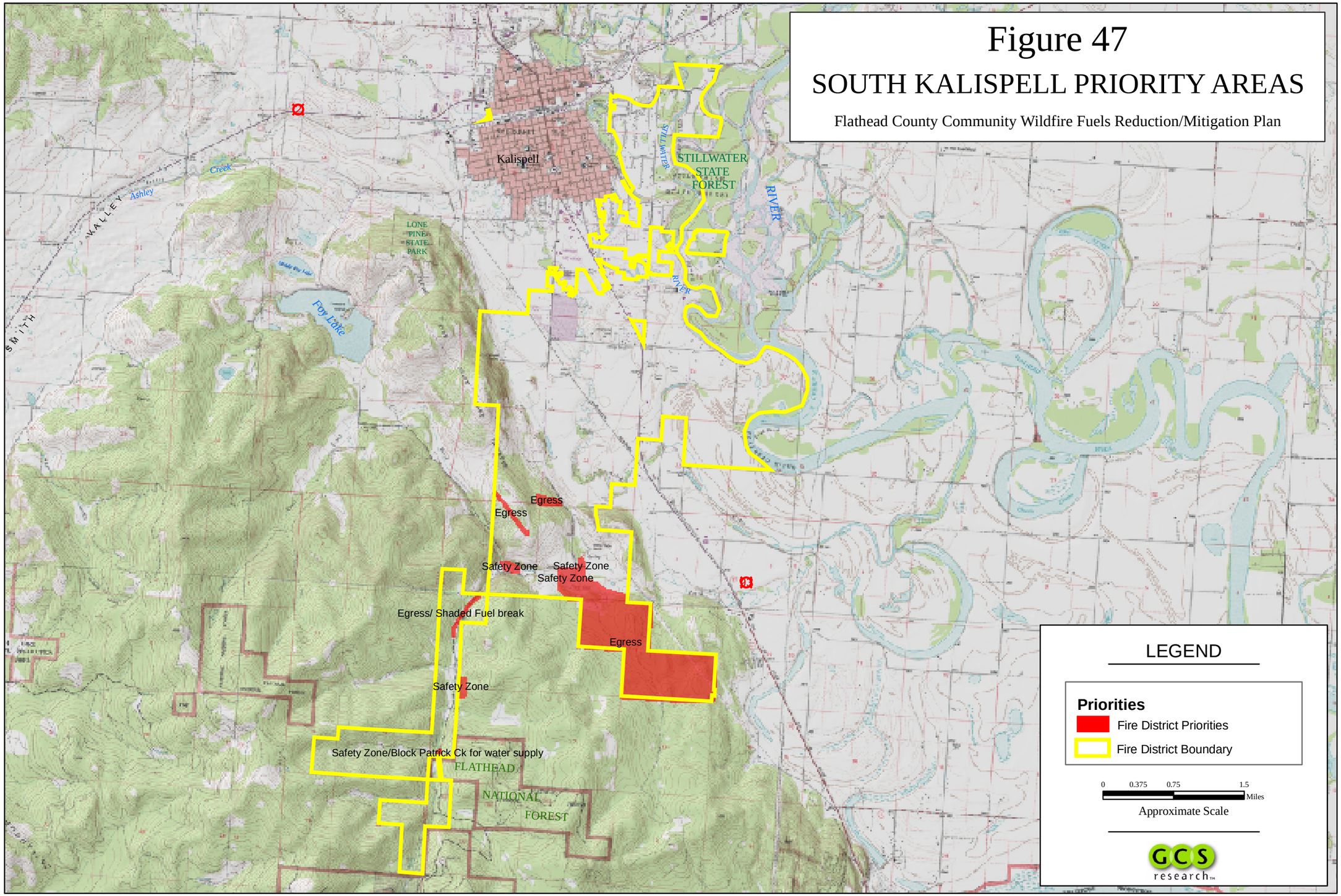

Figure 47: South Kalispell Priority Areas

Figure 48

SOUTH KALISPELL PARCELS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

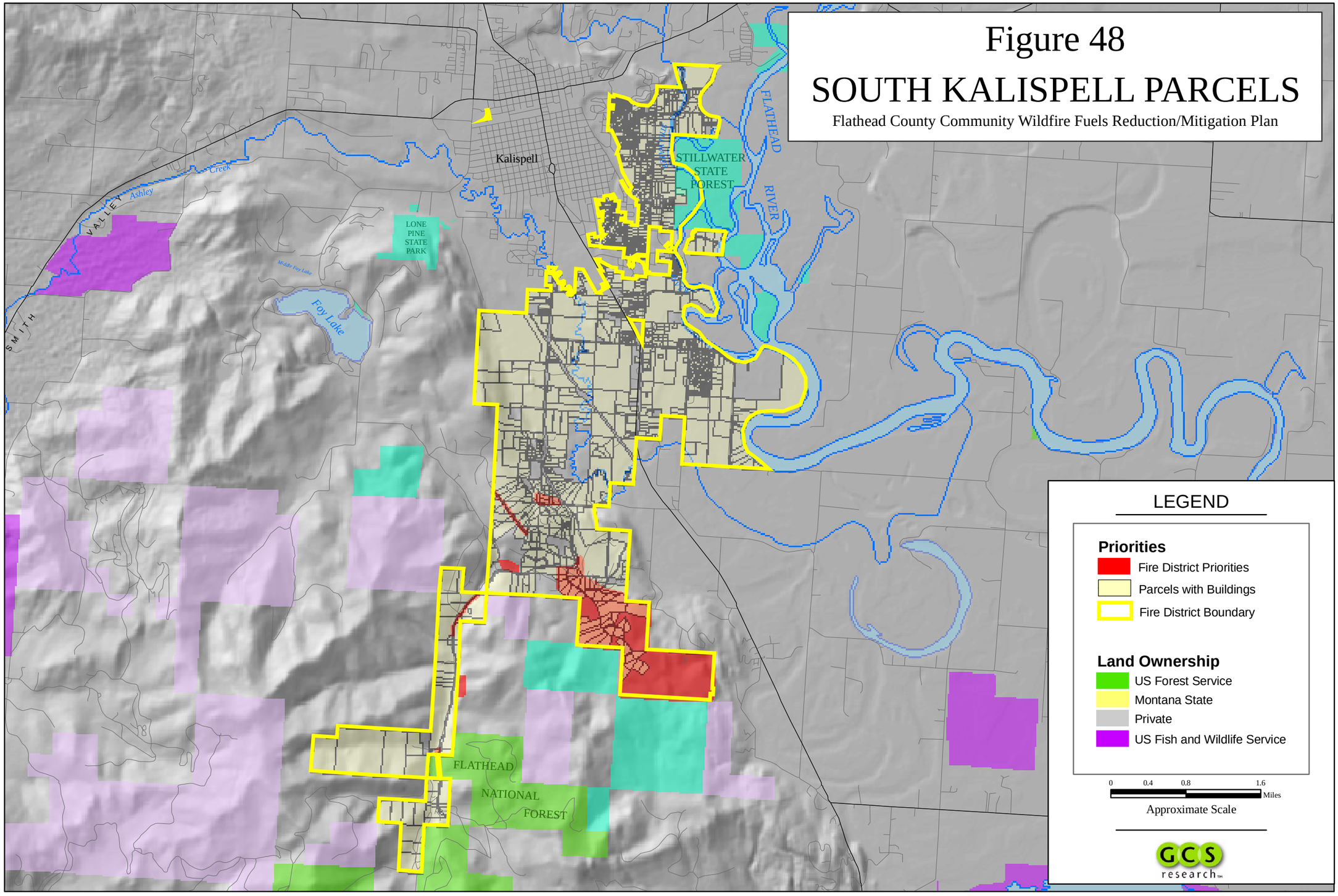

Figure 48: South Kalispell Priority Areas

Figure 49

SMITH VALLEY PRIORITY AREAS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

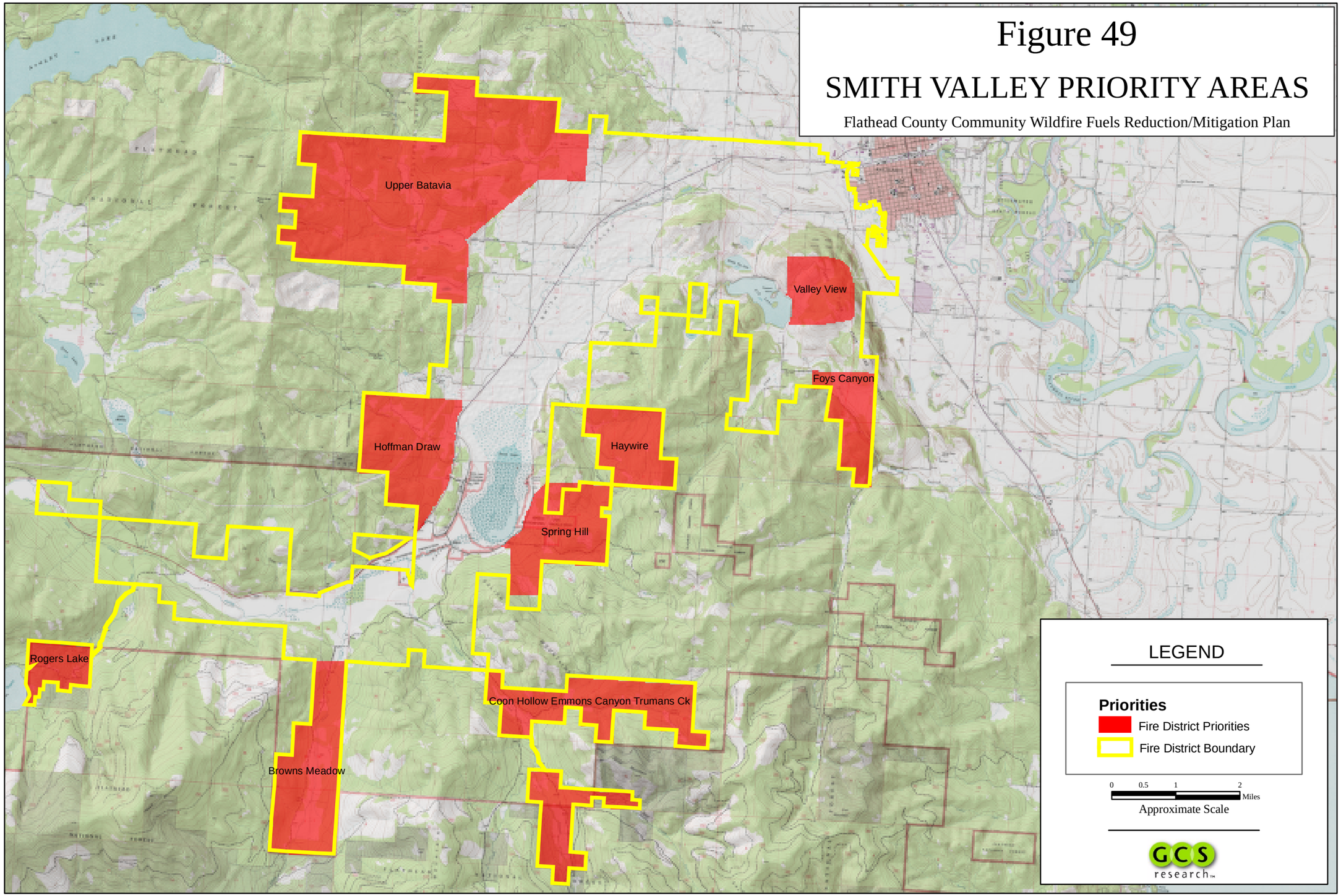

Figure 49: Smith Valley Priority Areas

Figure 50

SMITH VALLEY PARCELS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

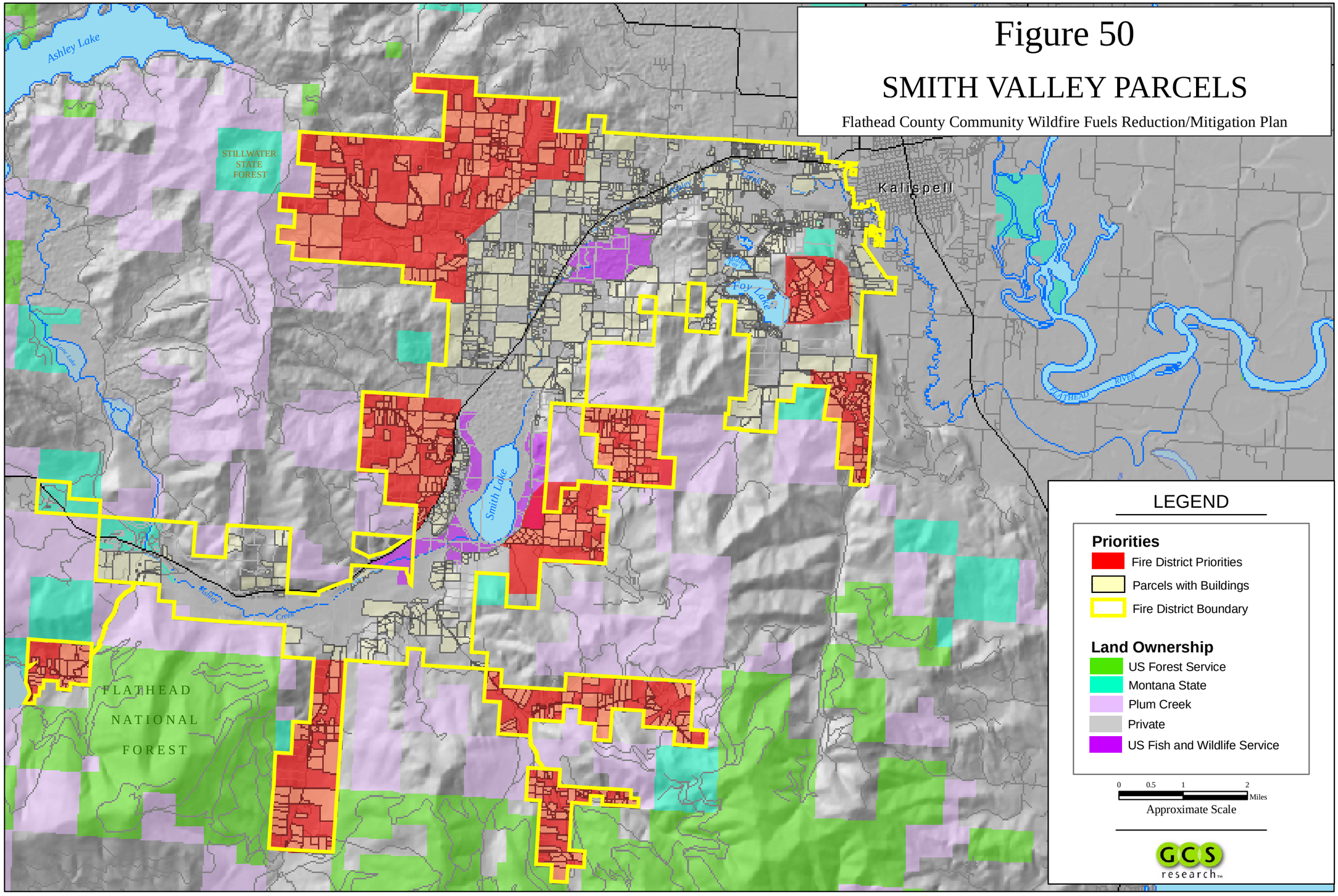

Figure 50: Smith Valley Parcels

Figure 51

SOMERS-LAKESIDE PRIORITY AREAS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

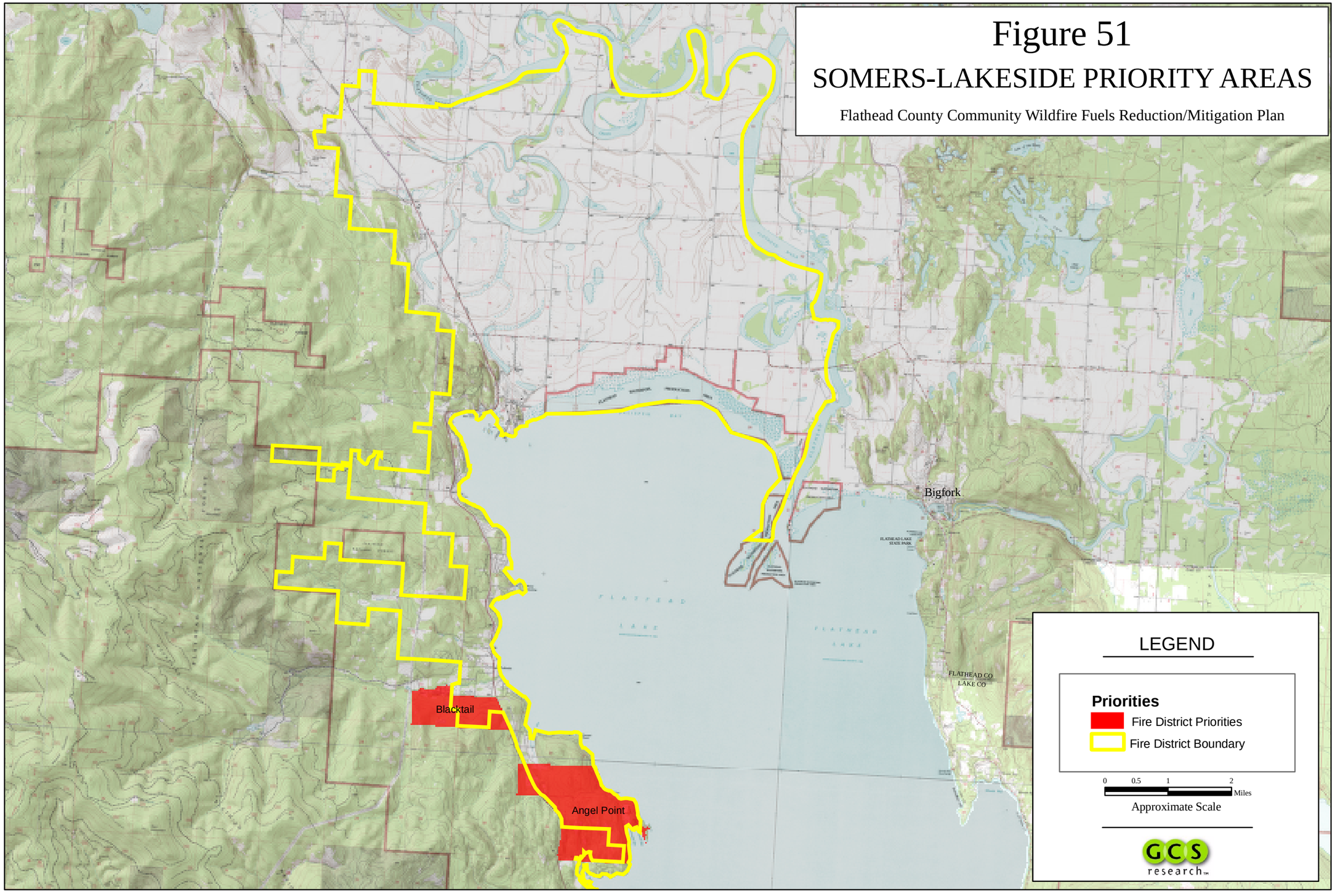

Figure 51: Somers - Lakeside Priority Areas

Figure 52

SOMERS-LAKESIDE PARCELS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

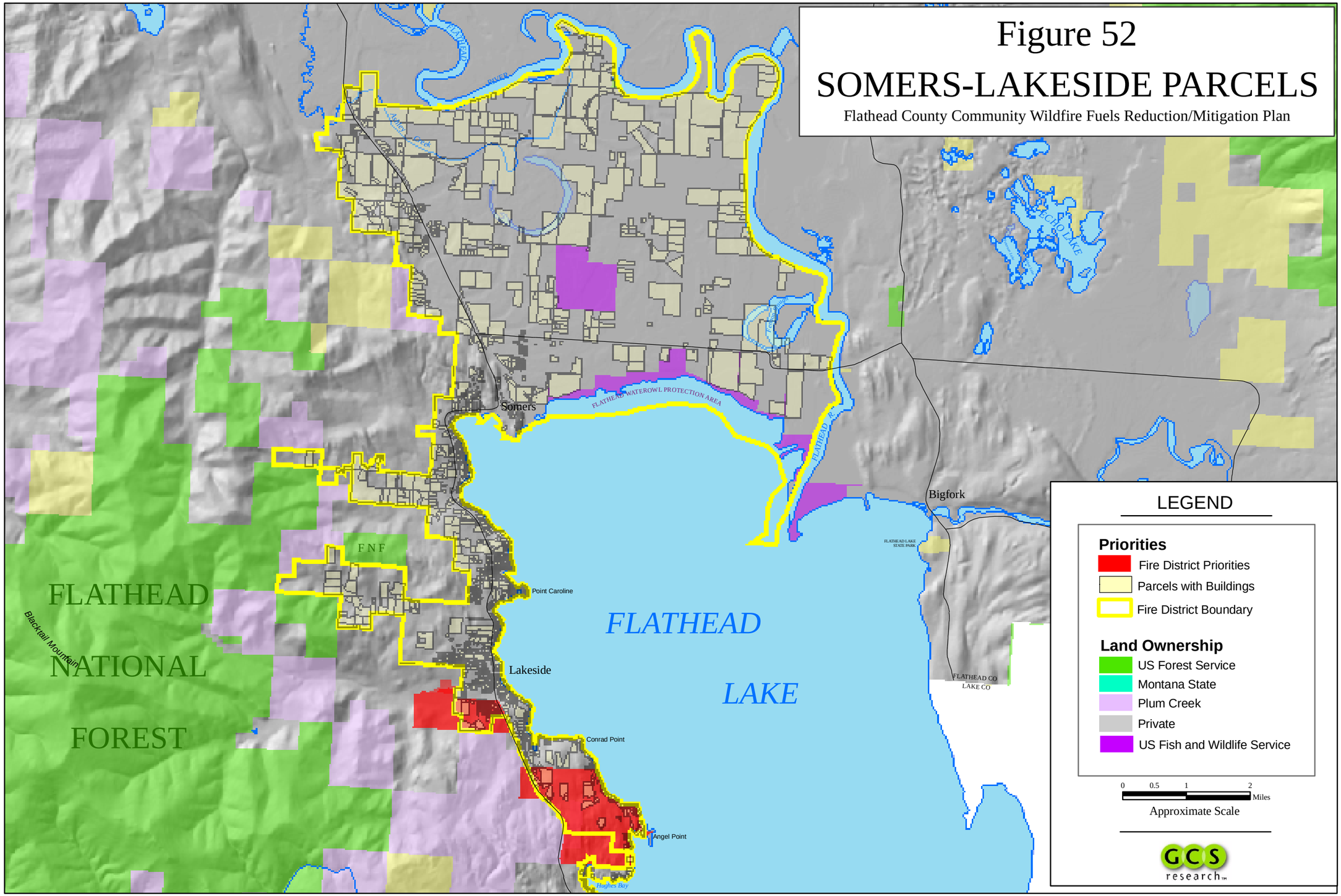

Figure 52: Somers - Lakeside Parcels

Figure 53
WEST VALLEY PRIORITY AREAS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

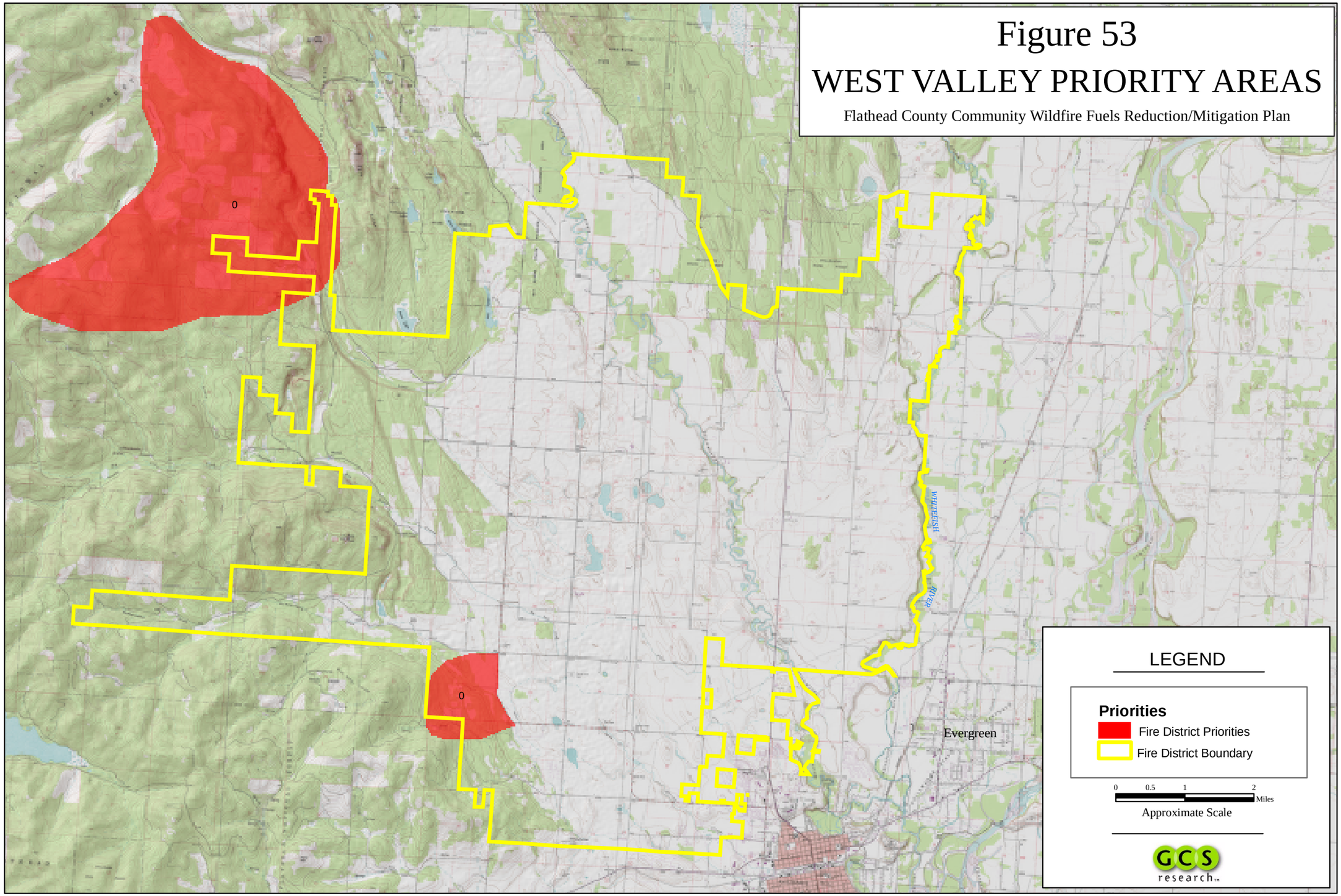

Figure 53: West Valley Priority Areas

Figure 54

WEST VALLEY PARCELS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

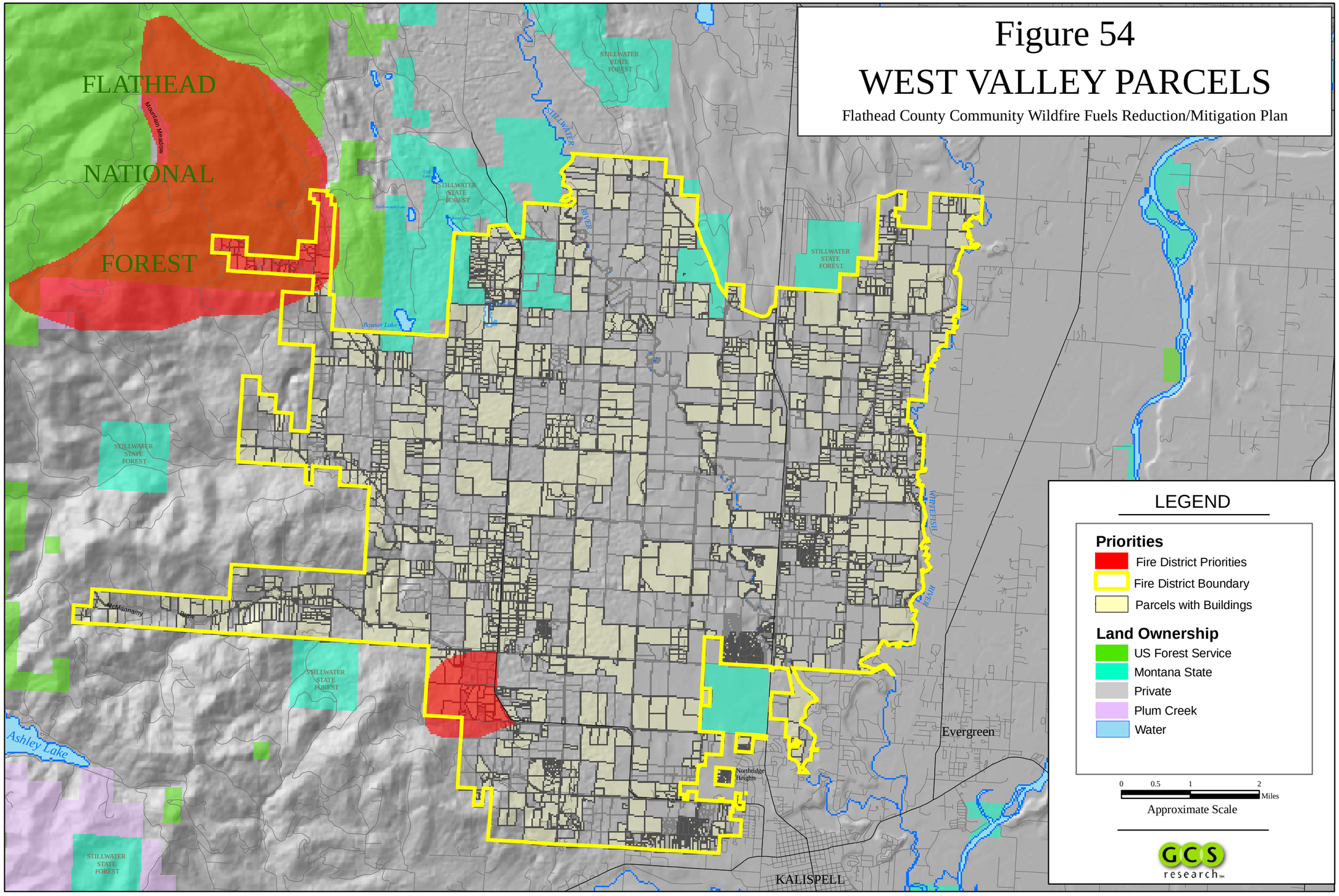

Figure 54: West Valley Parcels.

Figure 55

WHITEFISH RURAL PRIORITY AREAS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

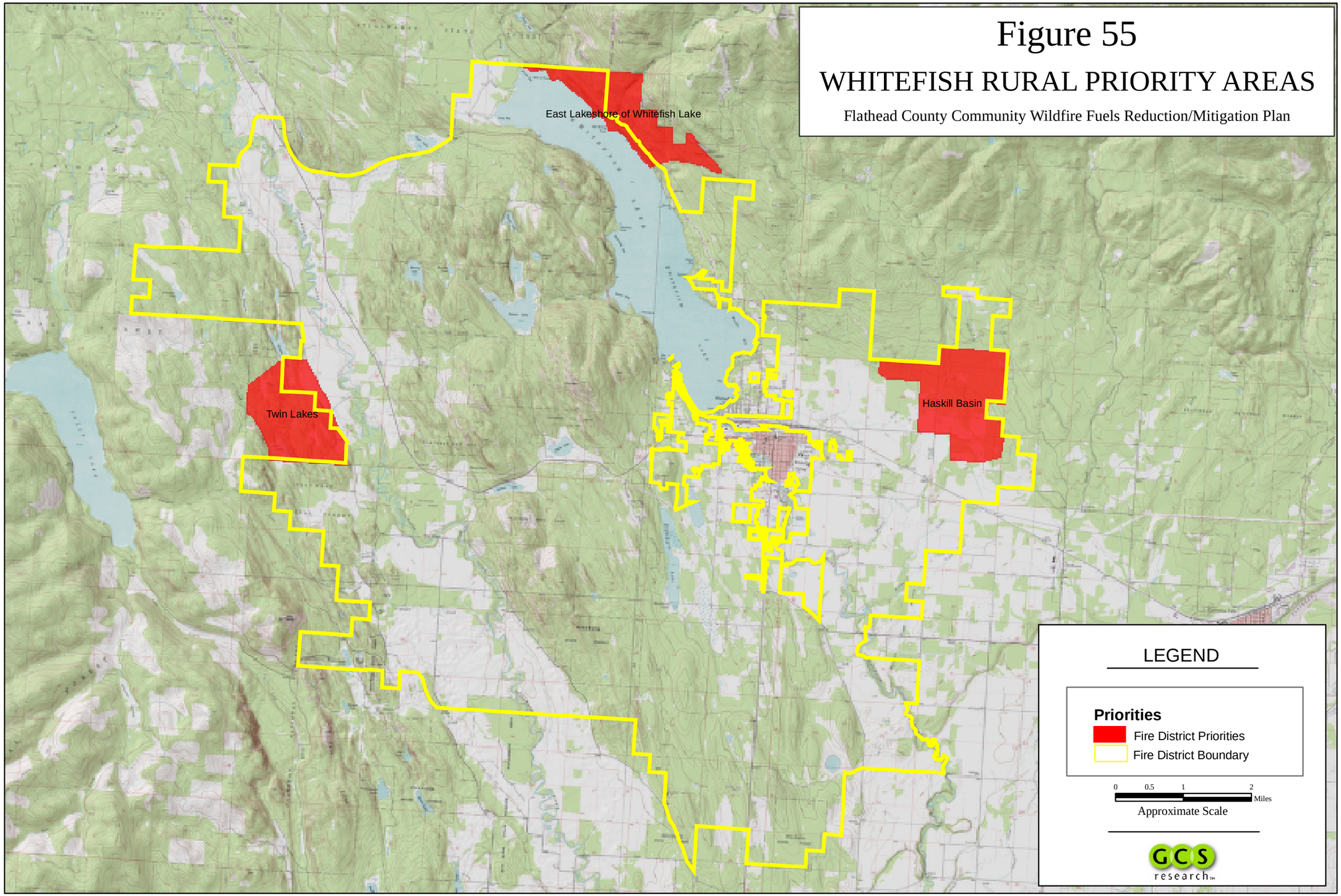

Figure 55: Whitefish Rural Priority Areas

Figure 56
WHITEFISH RURAL PARCELS

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

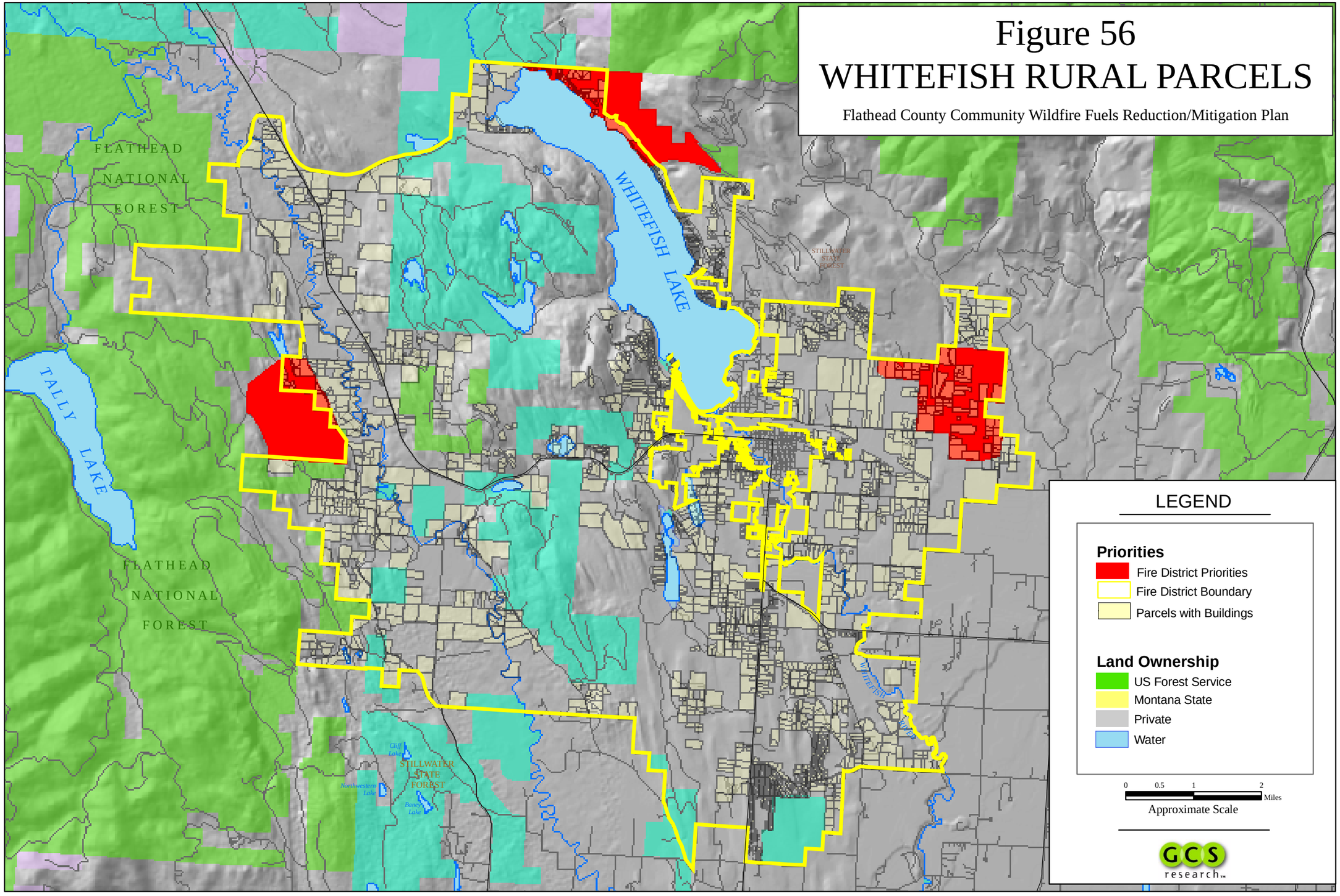

Figure 56: Whitefish Rural Parcels

Flathead County Plan Review and Summary: Moving Forward Hazard Reduction

In the proceeding chapters, the Flathead Community Wildfire Fuel Reduction/Mitigation Plan details the following:

1) definition(s) of the WUI and communities-at-risk assessments;

2) community-based and professional fire protection assessment and definition of the communities-at-risk within designated fire districts and fire service area;

3) geospatial definition of at-risk priority areas within the Flathead County study area as defined and modified by communities;

4) spatial statistics of the land area (parcel and tax records) and property values associated with priority areas;

5) recommendations for the adoption and extension of the Firewise program and additional home assessment strategies through Web-based geospatial solutions;

6) suggested, realistic fuel mitigation strategies and guidelines for these priority areas.

During the planning process, a final step involved a landscape- or county-wide scale assessment of the priority areas that were defined during earlier stages. Based upon input from community-members and responsible fire protection officials, district fire chiefs, priority areas were ranked at a landscape or county-wide scale. See Figure 56.

These include all areas that fall with known fire districts and the Fire Service Areas previously described. The ranking is: 1) Extreme; 2) High; 3) Medium-High; 4) Medium; and 5) Medium-Low. The ranking and associated rationale were reviewed by participating parties, generally supported in draft form, and are represented in this report. However, some local community members emphasized the need to include the community-scale priority areas in relation to the county-wide rankings. As requested, the detailed, community-scale priority areas are also depicted.

The key criteria for determining the rankings include: 1) life safety; 2) fuel hazards at landscape and community levels[1]; and 3) various environmental factors such as

[1] Fuel hazards were based upon professional opinion for the identified priority areas. Secondly, Woodland Restoration representative, Matt Arno, visited the various priority areas and added his expert opinion during relevant meetings for discussion of ranking criteria. Fuel mitigation projects may want to document fuel loads or volumes prior to and following a treatment. Monitoring of before and after conditions will be valuable for determining forest health with respect to future condition class assessment and fire hazard mitigation success.

known slope and prevailing wind direction that could result in catastrophic fire behavior. These criteria should not be construed as an exhaustive listing of known factors, but a general consensus on the dominant considerations. Certainly, human population density with respect to life safety was the major factor.

The identified priority areas are directly related to the protection of communities and essential infrastructure. Protection of inhabited structures through a combination of Firewise education and a range of appropriate fuel mitigation strategies serve as essential, future action items associated with the plan.

Integral to this phase, steering committee members, participating stakeholders groups, and local citizens relied upon the effective interagency collaboration and technical guidance provided by the USFS Flathead National Forest, MT DNRC, and local fire chiefs responsible for community protection from wildland fire. The value of this participation cannot be underestimated and highlights the importance of total community involvement during the CWPP process. As noted in the CWPP guidelines, convening decision-makers, involving federal agencies, and engaging all interested parties were achieved objectives during the evolution of the Flathead Community Wildfire Fuel Reduction/Mitigation Plan.

It is also important to note that the USFS Flathead National Forest is actively engaged in detailed fuel analysis in various locations across the study area. Flathead National Forest fuels analysis and planning areas are displayed in Figure 58.

Fuel treatments on Flathead National Forest's lands will vary according to site-specific analysis. Generally, more intense fuel reduction will be applied where national forests lands border private property. Depending upon various factors such as fuel loading and composition, topography, access and proximity to structures, these treatments will often then be less intense as distance from these private properties increase. Fuel reduction will be accomplished in a variety of ways and may include removal of dead and downed woody debris, removal of ladder fuels to prevent a ground fire from reaching the canopy and becoming a crown fire and thinning to create space between the tree crowns thus reducing the chances of a sustained crown fire. Prescribed fire, mechanical and hand treatments consisting of both commercial and pre-commercial thinning will be utilized to meet these objectives. A map depicting the overlay of the community-base priority areas and the Flathead National Forest fuel analysis study areas is shown in Figure 59.

The overlap of USFS priorities for fuel analysis and identified priority areas across the study area reflects an opportunity for further collaboration between federal agencies and the Flathead Steering committee. Resources can be joined in such as a way to maximize mutually defined objectives for fuel mitigation.

It is critical that the interagency collaboration and communication, which is already occurring in many areas throughout the study area, continue as the communities move toward proactive hazard reduction efforts. Moreover, community-based fuel

mitigation projects are encouraged and a natural extension of the existing planning process. As noted, certain areas such as the Northfork of the Flathead Valley are actively engaged in a planning process to identify hazards, implement fuel mitigation projects and, ultimately, work to protect life and property values from future wildland fire events. Other areas within the study area are equally engaged and are working to educate homeowners as to the risks associated with their geographical location as well as implement forest health restoration projects.

It is hoped that the analysis provided in this Flathead Community Wildfire Fuel Reduction/Mitigation Plan will serve as a solid foundation for addressing wildland fire risk within the priority area across Flathead County. The strength of this CWPP-based process lies in the level of collaboration exhibited by all stakeholders interested in reducing the risk to life and property within multiple communities. The community-based input was instrumental in helping define the WUI at the local scale and prioritizing areas where fuel mitigation project should be undertaken. In so far as national guidelines strongly recommend this type of approach and require the expert involvement of federal and state land management agencies, this working plan successfully incorporates this components. As the concerned parties moved toward implementation of fuel mitigation projects, the recommendations and guidelines represented in this plan will assist in a common framework for reducing risk from wildland fire. The plan itself should be seen as a dynamic document with detailed geospatial analysis of priority areas.

These data should be considered against the constantly changing set of environmental factors that comprise the state of the forest communities. Clearly, given the historical role of fire across the study plan landscape, fire itself cannot and should not be eliminated as a vital and important ecological factor in forest ecosystems. However, the utilization of this plan through continued community-based involvement and collaboration among all parties should effectively guide the successful reduction of wildland fire risk to human communities.

Figure 57
COUNTY-WIDE PRIORITIES

Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

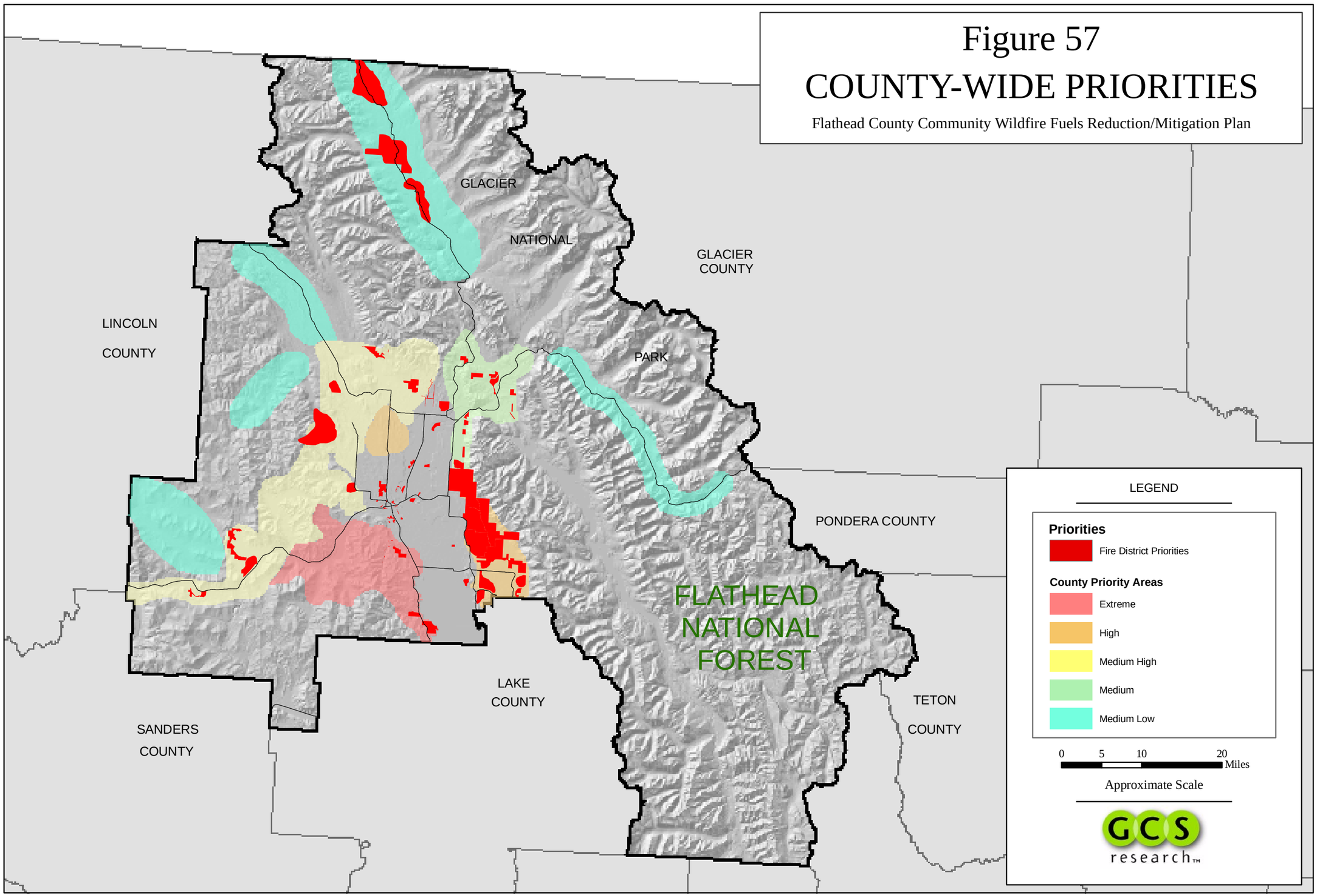

Figure 57: Flathead County study area and landscape scale priority setting.

Figure 58

FLATHEAD NATIONAL FOREST
PROPOSED FUELS ANALYSIS AND PLANNING AREAS
Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

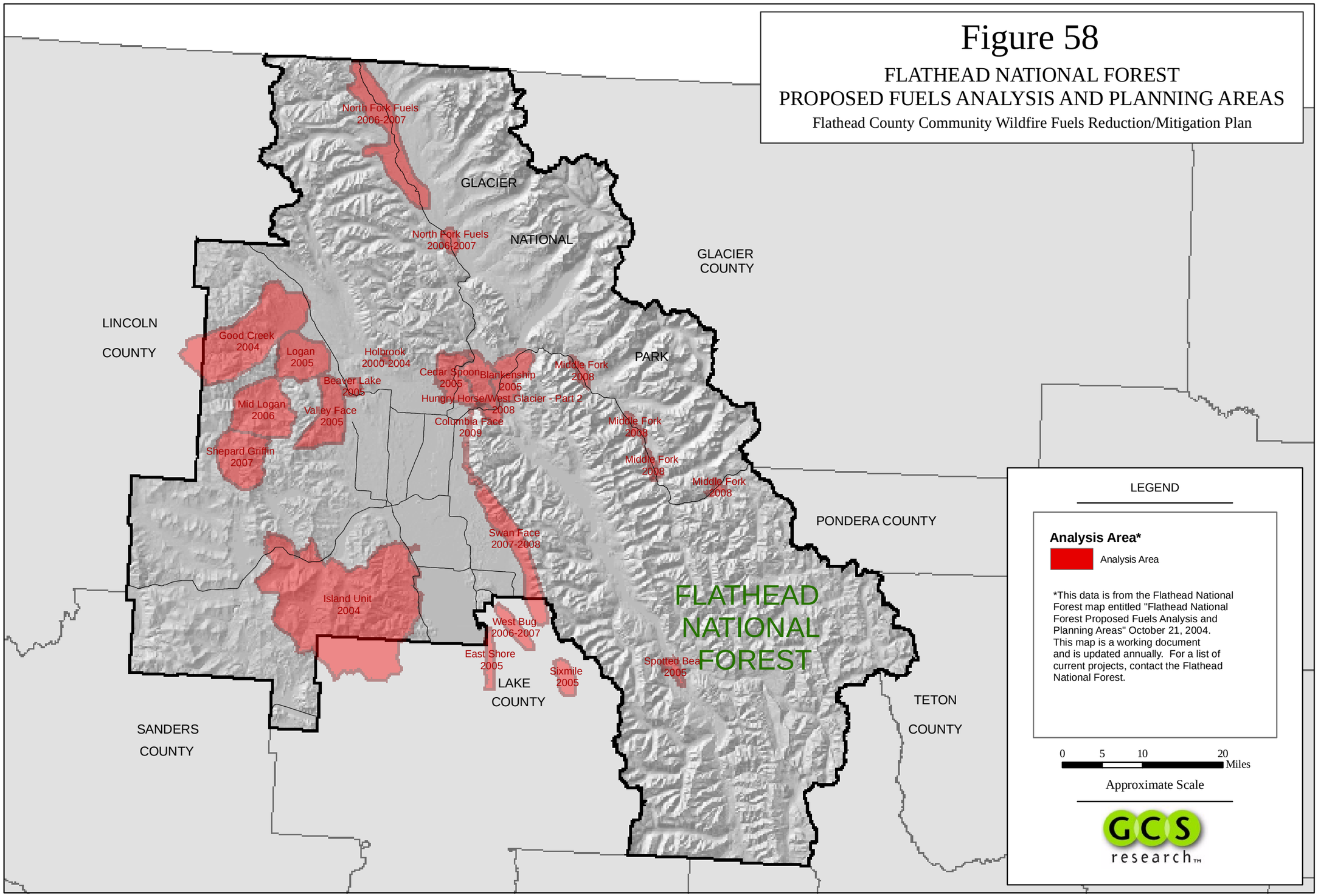

Figure 58: Flathead National Forest fuel analysis and planning areas. This represents a working document and is updated annually. For a list of current projects, contact the Flathead National Forest.

Figure 59
FUEL ANALYSIS AREAS
FLATHEAD NATIONAL FOREST
Flathead County Community Wildfire Fuels Reduction/Mitigation Plan

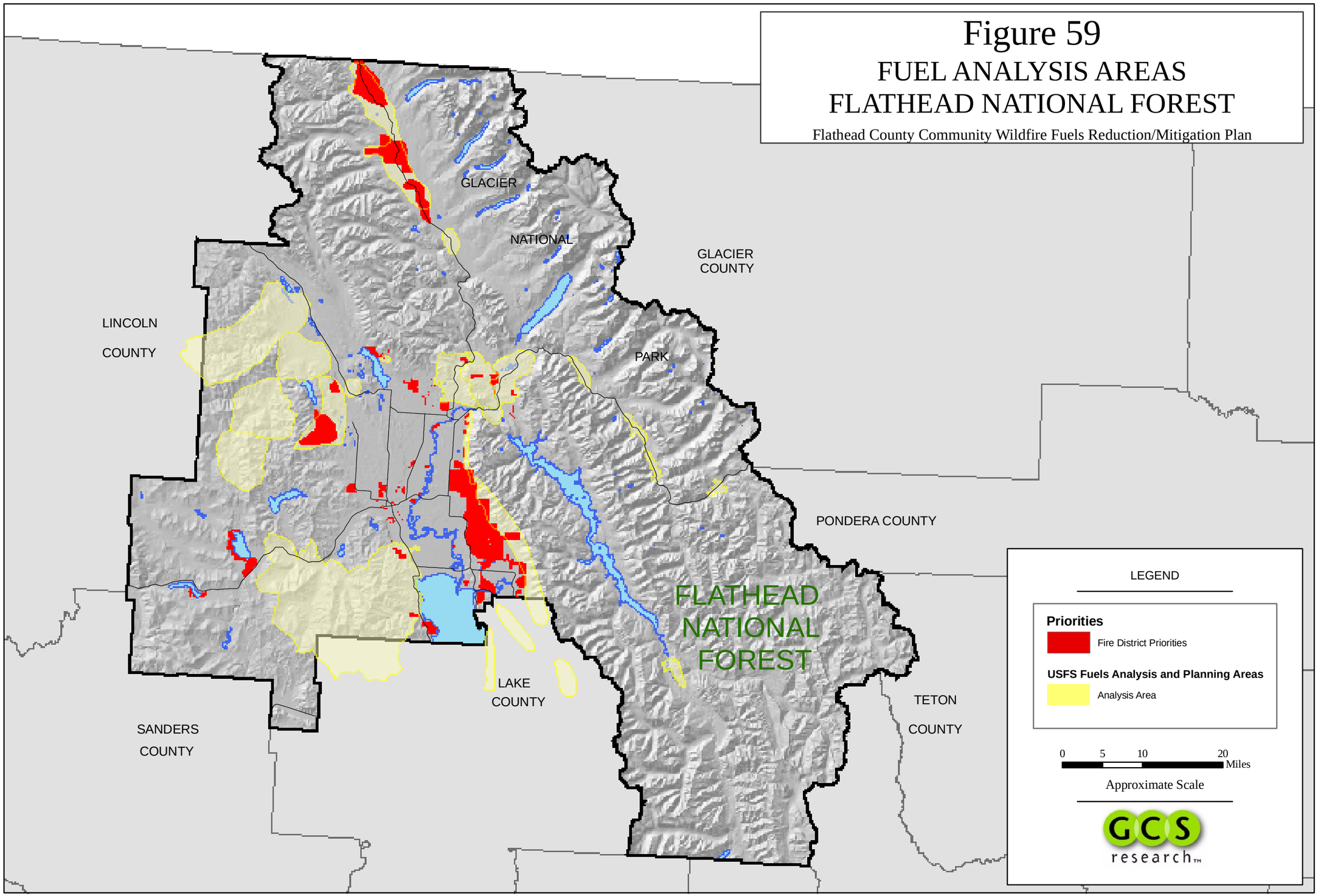

Figure 59: Flathead National Forest fuel analysis areas and Flathead Study area plan priority areas overlay map.

Appendix A

Glossary of Wildland Fire Terms

Aerial Fuels: All live and dead vegetation in the forest canopy or above surface fuels, including tree branches, twigs and cones, snags, moss, and high brush.

Aerial Ignition: Ignition of fuels by dropping incendiary devices or materials from aircraft.

Airtanker: A fixed-wing aircraft equipped to drop fire retardants or suppressants.

Agency: Any federal, state, or county government organization participating with jurisdictional responsibilities.

Anchor Point: An advantageous location, usually a barrier to fire spread, from which to start building a fireline. An anchor point is used to reduce the chance of firefighters being flanked by fire.

Aramid: The generic name for a high-strength, flame-resistant synthetic fabric used in the shirts and jeans of firefighters. Nomex, a brand name for aramid fabric, is the term commonly used by firefighters.

Aspect: Direction toward which a slope faces.

B

Backfire: A fire set along the inner edge of a fireline to consume the fuel in the path of a wildfire and/or change the direction of force of the fire's convection column.

Backpack Pump: A portable sprayer with a hand pump, fed from a liquid-filled container fitted with straps, used mainly in fire and pest control. (See also Bladder Bag.)

Bambi Bucket: A collapsible bucket slung below a helicopter. Used to dip water from a lake, stream, portable tank, etc. for fire suppression.

BEHAVE: A system of interactive computer programs for modeling fuel and fire behavior that includes BURN and FUEL.

Bladder Bag: A collapsible backpack portable sprayer made of neoprene or high-strength nylon fabric fitted with a pump. (See also Backpack Pump.)

Blow-up: A sudden increase in fire intensity or rate of spread strong enough to prevent direct control or to upset control plans. Blow-ups are often accompanied by violent convection and may have other characteristics of a firestorm. (See Flare-up.)

Brush: A collective term that refers to stands of vegetation dominated by shrubby, woody plant, or low-growing trees.

Brushfire: A fire burning in vegetation that is predominantly shrubs, brush, and scrub growth.

Bucket Drops: The dropping of water or retardant or suppressants from specially designed buckets slung below a helicopter.

Buffer Zones: An area of reduced vegetation that separates wildlands from vulnerable residential or business developments. This barrier is similar to a greenbelt in that it is usually used for another purpose such

as agriculture, recreation areas, parks, or golf courses.

Bump-up Method: A progressive method of building fireline on a wildfire without changing relative positions in the line. Work is begun with a suitable space between firefighters. Whenever one overtakes another, all crew members ahead move one space forward and resume work on the uncompleted part of the line. The last firefighter does not move ahead until completing his or her space.

Burn Out: To set fire inside a control line to widen the line or to consume fuel between the edge of the fire and the control line.

Burning Ban: A declared ban on open-air burning within a specified area, usually because of sustained high fire danger.

Burning Conditions: The state of the combined factors of the environment – such as winds, temperature, fuel moistures, and humidity – that affect fire behavior in a specified fuel type.

Burning Index: An estimate of the potential difficulty of fire containment as it relates to the flame length at the most rapidly spreading portion of a fire's perimeter.

Burning Period: That part of each 24-hour period when fires spread most rapidly, typically from 10:00 a.m. to sundown.

C

Campfire: As used to classify the cause of a wildland fire, a fire that was started for cooking or warming that spreads sufficiently from its source to require action by a fire control agency.

Candle or Candling: A single tree or a very small clump of trees burning from the bottom up.

Chain: A unit of linear measurement equal to 66 feet.

Closure: Legal restriction – but not necessarily elimination – of specified activities such as smoking, camping, or entry that might cause fires in a given area.

Cold Front: The leading edge of a relatively cold air mass that displaces warmer air. The heavier cold air may cause some of the warm air to be lifted. If the lifted air contains enough moisture, the result may be cloudiness, precipitation, and thunderstorms. If both air masses are dry, no clouds may form. Following the passage of a cold front in the Northern Hemisphere, westerly or northwesterly winds of 15 to 30 mph often continue for 12 to 24 hours.

Cold Trailing: A method of controlling a partly dead fire edge by carefully inspecting and feeling with the hand for heat to detect any fire. Live spots are dug out, and live edges are trenched.

Command Staff: The command staff on an incident management team includes the information officer, safety officer and liaison officer. They report directly to the incident commander (IC) and may have assistants.

Complex: Two or more individual incidents located in the same general area and assigned to a single incident commander or unified command.

Contain a fire: A fuel break around the fire has been completed. This break may include natural barriers and/or manually built fireline and/or mechanically constructed line.

Control a fire: To complete a control line around a fire, any spot fires therefrom, and any interior islands to

be saved; burn out any unburned area adjacent to the fire side of the control lines; and cool down all hotspots that are immediate threats to the control line, until the lines can reasonably be expected to hold.

Control Line: All built or natural fire barriers and treated fire edge used to control a fire.

Cooperating Agency: An agency supplying assistance other than direct suppression, rescue, support, or service functions to the incident control effort; e.g., Red Cross, law enforcement agency, telephone company.

Coyote Tactics: A progressive line construction duty involving self-sufficient crews that build fireline until the end of the operational period, remain at or near that point while off duty, and begin building fireline where they left off at the beginning of the next operational period.

Creeping Fire: Fire spreading slowly with a low flame.

Crew Boss: A person in supervisory charge of usually 16 to 21 firefighters and responsible for their performance, safety, and welfare.

Crown Fire (Crowning): The movement of fire through the crowns of trees or shrubs more or less independently of the surface fire.

Curing: Drying and browning of herbaceous vegetation or slash.

D

Dead Fuels: Fuels with no living tissue in which moisture content is governed almost entirely by atmospheric moisture (relative humidity and precipitation), dry-bulb temperature, and solar radiation.

Debris Burning: Any fire originally set for the purpose of clearing land or for rubbish, garbage, range, stubble, or meadow burning.

Defensible Space: An area either natural or manmade where material capable of causing a fire to spread has been treated, cleared, reduced, or changed to provide a barrier between an advancing wildland fire and the loss to life, property, or resources. In practice, defensible space is defined as an area with a minimum of 30 feet around a structure that is cleared of flammable brush or vegetation. Distance from the house and the degree of fuels treatment vary with vegetation type, slope, density, and other factors.

Deployment: Removing a fire shelter from its case and using it as protection against fire.

Detection: The act or system of discovering and locating fires.

Direct Attack: Any treatment of burning fuel, such as by wetting, smothering, or chemically quenching the fire or by physically separating burning from unburned fuel.

Dispatch: The implementation of a command decision to move a resource or resources from one place to another.

Dispatcher: A person employed who receives reports of discovery and status of fires, confirms their locations, takes action promptly to provide people and equipment likely to be needed for control in first attack, and sends them to the proper place.

Dispatch Center: A facility from which resources are directly assigned to an incident.

Division: Divisions are used to divide an incident into geographical areas of operation. Divisions are

established when the number of resources exceeds the span-of-control of the operations chief. A division is located with the Incident Command System organization between the branch and the task force/strike team.

Dozer: Any tracked vehicle with a front-mounted blade used for exposing mineral soil.

Dozer Line: Fireline constructed by the front blade of a dozer.

Driptorch: Hand-held device for igniting fires by dripping flaming liquid fuel on the materials to be burned; consists of a fuel fount, burner arm, and igniter. Fuel used is generally a mixture of diesel and gasoline.

Drop Zone: Target area for airtankers, helitankers, and cargo dropping.

Drought Index: A number representing net effect of evaporation, transpiration, and precipitation in producing cumulative moisture depletion in deep duff or upper soil layers.

Dry Lightning Storm: Thunderstorm in which negligible precipitation reaches the ground. Also called a dry storm.

Duff: The layer of decomposing organic materials lying below the litter layer of freshly fallen twigs, needles, and leaves and immediately above the mineral soil.

E

Energy Release Component (ERC): The computed total heat released per unit area (British thermal units per square foot) within the firefront at the head of a moving fire.

Engine: A truck that provides pumping, water, and hose capacity.

Engine Crew: Firefighters assigned to an engine. The Fireline Handbook defines the minimum crew makeup by engine type.

Entrapment: A situation where personnel are unexpectedly caught in a fire-behavior-related, life-threatening position where planned escape routes or safety zones are absent, inadequate, or compromised. An entrapment may or may not include deployment of a fire shelter, and such situations may or may not result in injury. They include "near misses."

Environmental Assessment (EA): EAs were authorized by the National Environmental Policy Act (NEPA) of 1969. They are concise, analytical documents prepared with public participation that determine whether an Environmental Impact Statement (EIS) is needed for a particular project or action. If an EA determines an EIS is not needed, the EA becomes the document allowing agency compliance with NEPA requirements.

Environmental Impact Statement (EIS): EISs were authorized by the National Environmental Policy Act (NEPA) of 1969. Prepared with public participation, they assist decision makers by providing information, analysis, and an array of action alternatives, allowing managers to see the probable effects of decisions on the environment. Generally, EISs are written for large-scale actions or geographical areas.

Equilibrium Moisture Content: Moisture content that a fuel particle will attain if exposed for an infinite period in an environment of specified constant temperature and humidity. When a fuel particle reaches equilibrium moisture content, net exchange of moisture between it and the environment is zero.

Escape Route: A preplanned and understood route firefighters take to move to a safety zone or other low-risk area, such as an already burned area, previously constructed safety area, a meadow that won't burn, or a natural rocky area large enough to take refuge in without being burned. When escape routes deviate from a

defined physical path, they should be clearly marked (flagged).

Escaped Fire: A fire which has exceeded or is expected to exceed initial attack capabilities or prescription.

Extended Attack Incident: A wildland fire that has not been contained or controlled by initial attack forces and for which more firefighting resources are arriving, en route, or being ordered by the initial attack incident commander.

Extreme Fire Behavior: "Extreme" implies a level of fire behavior characteristics that ordinarily precludes methods of direct control action. One of more of the following is usually involved: high rate of spread, prolific crowning and/or spotting, presence of fire whirls, strong convection column. Predictability is difficult because such fires often exercise some degree of influence on their environment and behave erratically and/or dangerously.

F

Faller: A person who fells trees. Also called a sawyer or cutter.

Field Observer: Person responsible to the Situation Unit Leader for collecting and reporting information about an incident obtained from personal observations and interviews.

Fine (Light) Fuels: Fast-drying fuels, generally with a comparatively high surface area-to-volume ratio, which are less than ¼-inch in diameter and have a timelag of one hour or less. These fuels readily ignite and are rapidly consumed by fire when dry.

Fingers of a Fire: The long narrow extensions of a fire projecting from the main body.

Fire Behavior: The manner in which a fire reacts to the influences of fuel, weather, and topography.

Fire Behavior Forecast: Prediction of probable fire behavior, usually prepared by a Fire Behavior Analyst (FBA), in support of fire suppression or prescribed burning operations.

Fire Behavior Specialist: A person responsible to the Planning Section Chief for establishing a weather data collection system and for developing fire behavior predictions based on fire history, fuel, weather, and topography.

Firebreak: A natural or constructed barrier used to stop or check fires that may occur, or to provide a control line from which to work.

Fire Cache: A supply of fire tools and equipment assembled in planned quantities or standard units at a strategic point for exclusive use in fire suppression.

Fire Crew: An organized group of firefighters under the leadership of a crew leader or other designated official. Includes Type 1 crews or hotshots, Type 2 crews, etc.

Fire Front: The part of a fire within which continuous flaming combustion is taking place. Unless otherwise specified, the fire front is assumed to be the leading edge of the fire perimeter. In ground fires, the fire front may be mainly smoldering combustion.

Fire Intensity: A general term relating to the heat energy released by a fire.

Fireline: A linear fire barrier that is cleared of fuels and scraped or dug to mineral soil. Also called control line or containment line or line.

Fire Load: The number and size of fires historically experienced on a specified unit over a specified period (usually one day) at a specified index of fire danger.

Fire Management Plan (FMP): A strategic plan that defines a program to manage wildland and prescribed fires and documents the Fire Management Program in the approved land use plan. The plan is supplemented by operational plans such as preparedness plans, preplanned dispatch plans, prescribed fire plans, and prevention plans.

Fire Perimeter: The entire outer edge or boundary of a fire. Note that acreage of a fire is determined or estimated by the fire's perimeter, but some substantially smaller acreage may have actually been burned within that perimeter.

Fire Season: 1) Period(s) of the year during which wildland fires are likely to occur, spread, and affect resource values sufficient to warrant organized fire management activities. 2) A legally enacted time during which burning activities are regulated by state or local authority.

Fire Shelter: An aluminized tent offering protection by means of reflecting radiant heat and providing a volume of breatheable air in a fire entrapment situation. Fire shelters should only be used in life-threatening situations, as a last resort.

Fire Shelter Deployment: Removing a fire shelter from its case and using it as protection against fire.

Firestorm: Violent convection caused by a large continuous area of intense fire. Often characterized by destructively violent surface indrafts, near and beyond the perimeter, and sometimes by tornado-like whirls.

Fire Triangle: Instructional aid in which the sides of a triangle are used to represent the three factors (oxygen, heat, fuel) necessary for combustion and flame production; removal of any of the three factors causes flame production to cease.

Fire Use Module (Prescribed Fire Module): A team of skilled and mobile personnel dedicated primarily to prescribed fire management. These are national and interagency resources, available throughout the prescribed fire season, that can ignite, hold, and monitor prescribed fires.

Fire Weather: Weather conditions that influence fire ignition, behavior, and suppression.

Fire Weather Watch: A term used by fire weather forecasters to notify using agencies, usually 24 to 72 hours ahead of the event, that current and developing meteorological conditions may evolve into dangerous fire weather.

Fire Whirl: Spinning vortex column of ascending hot air and gases rising from a fire and carrying aloft smoke, debris, and flame. Fire whirls range in size from less than one foot to more than 500 feet in diameter. Large fire whirls have the intensity of a small tornado.

Firefighting Resources: All people and major items of equipment that are or could be assigned to fires.

Flame Height: The average maximum vertical extension of flames at the leading edge of the fire front. Occasional flashes that rise above the general level of flames are not considered. This distance is less than the flame length if flames are tilted due to wind or slope.

Flame Length: The distance between the flame tip and the midpoint of the flame depth at the base of the flame (generally the ground surface); an indicator of fire intensity.

Flaming Front: The zone of a moving fire where the combustion is primarily flaming. Behind this flaming zone combustion is primarily glowing. Light fuels typically have a shallow flaming front, whereas heavy fuels have a deeper front. Also called fire front.

Flanks of a Fire: The parts of a fire's perimeter that are roughly parallel to the main direction of spread.

Flare-up: Any sudden acceleration of fire spread or intensification of a fire. Unlike a blow-up, a flare-up lasts a relatively short time and does not radically change control plans.

Flash Fuels: Fuels such as grass, leaves, dropped pine needles, ferns, tree moss, and some kinds of slash that ignite readily and are consumed rapidly when dry. Also called fine fuels.

Forb: A plant with a soft, rather than permanent woody stem, that is not a grass or grass-like plant.

Fuel: Combustible material. Includes vegetation such as grass, leaves, ground litter, plants, shrubs, and trees that feed a fire. (See Surface Fuels.)

Fuel Bed: An array of fuels usually constructed with specific loading, depth and particle size to meet experimental requirements; also, commonly used to describe the fuel composition in natural settings.

Fuel Loading: The volume of fuel present expressed quantitatively in terms of weight of fuel per unit area.

Fuel Model: Simulated fuel complex (or combination of vegetation types) for which all fuel descriptors required for the solution of a mathematical rate of spread model have been specified.

Fuel Moisture (Fuel Moisture Content): The quantity of moisture in fuel expressed as a percentage of the weight when thoroughly dried at 212 degrees Fahrenheit.

Fuel Reduction: Manipulation, including combustion and/or or removal of fuels to reduce the likelihood of ignition and/or to lessen potential damage and resistance to control.

Fuel Type: An identifiable association of fuel elements of a distinctive plant species, form, size, arrangement, or other characteristics that will cause a predictable rate of fire spread or difficulty of control under specified weather conditions.

Fusee: A colored flare designed as a railway warning device and widely used to ignite suppression and prescription fires.

G

General Staff: The group of incident management personnel reporting to the incident commander. They may each have a deputy. Staff members include operations section chief, planning section chief, logistics section chief, and finance/administration section chief.

Geographic Area: A political boundary designated by the wildland fire protection agencies, where these agencies work together in the coordination and effective utilization of resources. See www.fs.fed.us/fire/reports.shtml for a listing of and links to Geographic Area Coordination Centers.

Ground Fuel: All combustible materials below the surface litter (including duff, tree or shrub roots, punchy wood, peat, and sawdust) that normally support a glowing combustion without flame.

H

Haines Index: An atmospheric index used to indicate the potential for wildfire growth by measuring the stability and dryness of the air over a fire.

Hand Line: A fireline built with hand tools.

Hazard Reduction: Any treatment of a hazard that reduces the threat of ignition and fire intensity or rate of spread.

Head of a Fire: The side of the fire having the fastest rate of spread.

Heavy Fuels: Fuels of large diameter (such as snags, logs, and large limb wood) that ignite and are consumed more slowly than flash fuels.

Helibase: The main location within the general incident area for parking, fueling, maintaining, and loading helicopters. The helibase is usually at or near the incident base.

Helispot: A temporary landing spot for helicopters.

Helitack: The use of helicopters to transport crews, equipment, and fire retardants or suppressants to the fireline.

Helitack Crew: A group of firefighters trained in the technical and logistical use of helicopters for fire suppression.

Holding Actions: Planned actions required to achieve wildland prescribed fire management objectives. These actions have specific timeframes for fire use actions but can have less sensitive implementation demands for suppression actions.

Holding Resources: Firefighting personnel and equipment assigned to do all required fire suppression work following fireline construction but generally not including extensive mop-up.

Hose Lay: Arrangement of connected lengths of fire hose and accessories on the ground, beginning at the first pumping unit and ending at the point of water delivery.

Hotshot Crew: A highly trained fire crew used mainly to build fireline by hand. Hotshots are usually the crews called upon to fight fire in the most rugged and inaccessible areas on a fire, when highly specialized training and experience are necessary.

Hotspot: A particular active part of a fire.

Hotspotting: Reducing or stopping the spread of fire at points of particularly rapid rate of spread or special threat, generally the first step in prompt control, with emphasis on first priorities.

I

Incident: A human-caused or natural occurrence, such as wildland fire, that requires emergency service action to prevent or reduce the loss of life or damage to property or natural resources. Incident management teams also handle other non-fire emergency response, including tornadoes, floods, hurricanes, earthquakes, and other disasters or large events.

Incident Action Plan (IAP): Contains objectives reflecting the overall incident strategy and specific tactical actions and supporting information for the next operational period. The plan may be oral or written. When written, the plan may have a number of attachments, including objectives, assignment list, division

assignment, incident radio communication plan, medical plan, traffic plan, safety plan, and incident map.

Incident Command Post (ICP): Location at which primary command is executed. The ICP may be co-located with the incident base or other incident facilities.

Incident Command System (ICS): The combination of facilities, equipment, personnel, procedure, and communications operating within a common organizational structure, with responsibility for the management of assigned resources to effectively accomplish objectives on an incident.

Incident Commander: The individual responsible for the management of all incident operations at the incident site.

Incident Management Team: The incident commander and appropriate general or command staff assigned to manage an incident.

Incident Objectives: Statements of guidance and direction necessary for selection of appropriate strategy and the tactical direction of resources. Incident objectives are based on realistic expectations of what can be accomplished when all allocated resources have been effectively deployed.

Infrared Detection: The use of heat sensing equipment – Infrared Scanners – for detection of heat sources that are not visible by the normal surveillance methods of either ground or air patrols.

Initial Attack: The actions taken by the first resources to arrive at a wildfire to protect lives and property and prevent further extension of the fire.

J

Job Hazard Analysis: This analysis of a project is completed by staff to identify hazards to employees and the public. It identifies hazards, corrective actions, and the required safety equipment to ensure public and employee safety.

Jump Spot: Selected landing area for smokejumpers.

Jump Suit: Protection suit worn by smokejumpers.

K

Keetch-Byram Drought Index (KBDI): Commonly-used drought index adapted for fire management applications, with a numerical range from 0 (no moisture deficiency) to 800 (maximum drought).

Knock Down: To reduce the flame or heat on the more vigorously burning parts of a fire edge.

L

Ladder Fuels: Fuels which provide vertical continuity between strata and allow fire to carry from surface fuels into the crowns of trees or shrubs with relative ease. They help initiate and assure the continuation of crowning.

Large Fire: 1. For statistical purposes, a fire burning more than 100 acres. 2) A fire burning with a size and intensity such that its behavior is determined by interaction between its own convection column and weather conditions above the surface.

Lead Plane: Aircraft with pilot used to make dry runs over the target area to check wing and smoke

conditions and topography and to lead airtankers to targets and supervise their drops.

Light (Fine) Fuels: Fast-drying fuels, generally with a comparatively high surface area-to-volume ratio, which are less than ¼-inch in diameter and have a timelag of one hour or less. These fuels ignite readily and are rapidly consumed by fire when dry.

Lightning Activity Level (LAL): A number, on a scale of 1 to 6, that reflects frequency and character of cloud-to-ground lightning. The scale is exponential, based on powers of 2 (i.e., LAL 3 indicates twice the lightning of LAL 2).

Line Scout: A firefighter who determines the location for a fireline to be built.

Litter: Top layer of the forest, scrubland, or grassland floor, directly above the fermentation layer, composed of loose debris of dead sticks, branches, twigs, and recently fallen leaves or needles, little altered in structure by decomposition.

Live Fuels: Living plants, such as trees, grasses, and shrubs, in which the seasonal moisture content cycle is controlled largely by internal physiological mechanisms, rather than by external weather influences.

M

Micro-Remote Environmental Monitoring System (Micro-REMS): Mobile weather monitoring station. A Micro-REMS usually accompanies an incident meteorologist and ATMU to an incident.

Mineral Soil: Soil layers below the predominantly organic horizons; soil with little combustible material.

Mobilization: The process and procedures used by all organizations f(ederal, state and local) for activating, assembling, and transporting all resources that have been requested to respond to or support an incident.

Modular Airborne Firefighting System (MAFFS): A manufactured unit consisting of five interconnecting tanks, a control pallet, and a nozzle pallet, with a capacity of 3,000 gallons, designed to be rapidly mounted inside an unmodified C-130 (Hercules) cargo aircraft for use in dropping retardant on wildland fires.

Mop-up: To make a fire safe or reduce residual smoke after the fire has been controlled by extinguishing or removing burning material along or near the control line, felling snags, or moving logs so they won't roll downhill.

Multi-Agency Coordination (MAC): A generalized term which describes the functions and activities of representatives of involved agencies and/or jurisdictions who come together to make decisions regarding the prioritizing of incidents, and the sharing and use of critical resources. The MAC organization is not a part of the on-scene ICS and is not involved in developing incident strategy or tactics.

Mutual Aid Agreement: Written agreement between agencies and/or jurisdictions in which they agree to assist one another upon request, by furnishing personnel and equipment.

N

National Environmental Policy Act (NEPA): NEPA is the basic national law for protection of the environment, passed by Congress in 1969. It sets policy and procedures for environmental protection, and authorizes Environmental Impact Statements and Environmental Assessments to be used as analytical tools to help federal managers make decisions on management of federal lands.

National Fire Danger Rating System (NFDRS): A uniform fire danger rating system that focuses on the

environmental factors that control the moisture content of fuels.

National Wildfire Coordinating Group: The NWCG was formed under the direction of the Secretaries of Agriculture and the Interior and includes representatives of the U.S. Forest Service, Bureau of Land Management, Bureau of Indian Affairs, National Park Service, U.S. Fish and Wildlife Service and National Association of State Foresters. The group's purpose is to facilitate coordination and effectiveness of wildland fire activities and provide a forum to discuss, recommend action, or resolve issues and problems of substantive nature. NWCG is the certifying body for all courses in the National Fire Curriculum.

Nomex ®: Trade name for a fire-resistant synthetic material used in the manufacturing of flight suits and pants and shirts used by firefighters (see Aramid).

Normal Fire Season: 1) A season when weather, fire danger, and number and distribution of fires are about average. 2) Period of the year that normally comprises the fire season.

O

Operations Branch Director: Person under the direction of the operations section chief who is responsible for implementing that portion of the incident action plan appropriate to the branch.

Operational Period: The period of time scheduled for execution of a set of tactical actions as specified in the Incident Action Plan. Operational periods can be of various lengths, although usually not more than 24 hours.

Overhead: People assigned to supervisory positions, including incident commanders, command staff, general staff, directors, supervisors, and unit leaders.

P

Pack Test: Used to determine the aerobic capacity of fire suppression and support personnel and assign physical fitness scores. The pack test requires walking a specified distance, with or without a weighted pack, in a predetermined period of time, with altitude corrections. The pack test for arduous duty, which most firefighters must pass, requires a 3-mile hike with a 45 lb. pack in 45 minutes or less. Other tests in the Work Capacity Testing group have different requirements for different levels of work required by the job.

Paracargo: Cargo that's dropped, or intended for dropping, from an aircraft by parachute, by other retarding devices, or by free-fall.

Peak Fire Season: That period of the fire season during which fires are expected to ignite most readily, to burn with greater than average intensity, and to create damages at an unacceptable level.

Personnel Protective Equipment (PPE): All firefighting personnel must be equipped with proper equipment and clothing in order to mitigate the risk of injury from, or exposure to, hazardous conditions encountered while working. PPE includes 8-inch laced leather boots with lug soles, fire shelter, hard hat with chin strap, goggles, ear plugs, aramid shirts and trousers, leather gloves, and individual first aid kits.

Preparedness: Condition or degree of being ready to cope with a potential fire situation.

Prescribed Fire: Any fire ignited by management actions under certain predetermined conditions to meet specific objectives related to hazardous fuels or habitat improvement. A written prescribed fire plan must exist, and NEPA requirements must be met prior to ignition.

Prescribed Fire Plan (Burn Plan): This document provides the prescribed fire burn boss information

needed to implement an individual prescribed fire project.

Prescription: Measurable criteria that define conditions under which a prescribed fire may be ignited, guide selection of appropriate management responses, and indicate other required actions. Prescription criteria may include a combination of safety, economic, public health, environmental, geographic, administrative, social, or legal considerations.

Prevention: Activities directed at reducing the incidence of fires, including public education, law enforcement, personal contact, and reduction of fuel hazards.

Project Fire: A fire of such size or complexity that a large organization and prolonged activity is required to suppress it.

Pulaski: A combination chopping and trenching tool that combines a single-bitted ax blade with a narrow adze-like trenching blade fitted to a straight handle. Useful for grubbing or trenching in duff and matted roots. Well-balanced for chopping.

R

Radiant Burn: A burn received from a radiant heat source.

Radiant Heat Flux: The heat flowing through a given area in a given time, usually expressed as calories/square centimeter/second.

Rappelling: Technique of landing specifically trained firefighters from hovering helicopters; involves sliding down ropes with the aid of friction-producing devices.

Rate of Spread: The relative activity of a fire in extending its horizontal dimensions. It is expressed as a rate of increase of the total perimeter of the fire, as rate of forward spread of the fire front, or as rate of increase in area, depending on the intended use of the information. Usually it is expressed in chains or acres per hour for a specific period in the fire's history.

Reburn: The burning of an area that has been previously burned but that contains flammable fuel that ignites when burning conditions are more favorable; an area that has reburned.

Red Card: Fire qualification card issued to fire-rated persons showing their training needs and their qualifications to fill specified fire suppression and support positions in a large fire suppression or incident organization.

Red Flag Warning: Term used by fire weather forecasters to alert forecast users to an ongoing or imminent critical fire weather pattern.

Rehabilitation: The activities necessary to repair damage or disturbance caused by wildland fires or the fire suppression activity.

Relative Humidity (RH): The ratio of the amount of moisture in the air to the maximum amount of moisture that air would contain if it were saturated. The ratio of the actual vapor pressure to the saturated vapor pressure.

Remote Automatic Weather Station (RAWS): An apparatus that automatically acquires, processes, and stores local weather data for hourly transmission to the GOES satellite. The near "real-time" data is re-transmitted to an earth-receiving station for use in fire management applications including the National Fire Danger Rating System.

Resources: 1) Personnel, equipment, services, and supplies available or potentially available for assignment to incidents. 2) The natural resources of an area, such as timber, grass, watershed values, recreation values, and wildlife habitat.

Resource Management Plan (RMP): A document prepared by field office staff with public participation and approved by field office managers that provides general guidance and direction for land management activities at a field office. The RMP identifies the need for fire in a particular area and for a specific benefit.

Resource Order: An order placed for firefighting or support resources.

Retardant: A substance or chemical agent which reduces the flammability of combustibles.

Run (of a fire): The rapid advance of the head of a fire with a marked change in intensity and rate of spread from that noted before and after the advance.

Running fire: A rapidly spreading surface fire with a well-defined head.

S

Safety Zone: An area cleared of flammable materials used for escape in the event the line is outflanked or in case a spot fire causes fuels outside the line to render the line unsafe. In firing operations, crews progress so as to maintain a safety zone close at hand, allowing the fuels inside the control line to be consumed before going ahead. Safety zones may also be constructed as integral parts of fuel breaks; they are greatly enlarged areas which can be used with relative safety by firefighters and their equipment in the event of a blowup in the vicinity.

Scratch Line: An unfinished preliminary fireline hastily established or built as an emergency measure to check the spread of fire.

Severity Funding: Funds provided to increase suppression response capability necessitated by abnormal weather patterns, extended drought, or other events causing abnormal increase in the fire potential and/or danger.

Single Resource: An individual, a piece of equipment and its personnel complement, or a crew or team of individuals with an identified work supervisor that can be used on an incident.

Size up: To evaluate a fire to determine a course of action for fire suppression.

Slash: Debris left after logging, pruning, thinning, or brush cutting; includes logs, chips, bark, branches, stumps, and broken understory trees or brush.

Sling Load: Cargo carried beneath a helicopter and attached by a lead line and swivel.

Slop-over: A fire edge that crosses a control line or natural barrier intended to contain the fire.

Smokejumper: A firefighter who travels to fires by aircraft and parachute.

Smoke Management: Application of fire intensities and meteorological processes to minimize degradation of air quality during prescribed fires.

Smoldering Fire: A fire burning without flame and barely spreading.

Snag: A standing dead tree or part of a dead tree from which at least the smaller branches have fallen.

Spark Arrester: A device installed in a chimney, flue, or exhaust pipe to stop the emission of sparks and burning fragments.

Spot Fire: A fire ignited outside the perimeter of the main fire by flying sparks or embers.

Spot Weather Forecast: A special forecast issued to fit the time, topography, and weather of each specific fire. These forecasts are issued upon request of the user agency and are more detailed, timely, and specific than zone forecasts.

Spotter: In smokejumping, the person responsible for selecting drop targets and supervising all aspects of dropping smokejumpers from aircraft.

Spotting: Behavior of a fire producing sparks or embers that are carried by the wind and start new fires beyond the zone of direct ignition by the main fire.

Staging Area: Location set up at an incident where resources are placed while awaiting a tactical assignment on a 3-minute available basis. Staging areas are managed by the operations section.

Strategy: The science and art of command as applied to the overall planning and conduct of an incident.

Strike Team: Specified combinations of the same kind and type of resources, with common communications and a leader.

Strike Team Leader: Person responsible to a division/group supervisor for performing tactical assignments given to the strike team.

Structure Fire: Fire originating in and burning any part or all of any building.

Suppressant: An agent such as water or foam used to extinguish the flaming and glowing phases of combustion when directly applied to burning fuels.

Suppression: All the work of extinguishing or containing a fire, beginning with its discovery.

Surface Fuels: Loose surface litter on the soil surface, normally consisting of fallen leaves or needles, twigs, bark, cones, and small branches that have not yet decayed enough to lose their identity; also grasses, forbs, low and medium shrubs, tree seedlings, heavier branchwood, downed logs, and stumps interspersed with or partially replacing the litter.

Swamper: (1) A firefighter who assists fallers and/or sawyers by clearing away brush, limbs, roots, small trees, etc. from the fireline. Carries fuel, oil, and tools and watches for dangerous situations. (2) A worker on a dozer crew who pulls winch line, helps maintain equipment, etc., to speed suppression work on a fire.

T

Tactics: Deploying and directing resources on an incident to accomplish the objectives designated by strategy.

Temporary Flight Restriction (TFR): A restriction requested by an agency and put into effect by the Federal Aviation Administration in the vicinity of an incident. The TFR restricts the operation of nonessential aircraft in the airspace around that incident.

Terra Torch ®: Device for throwing a stream of flaming liquid, used to facilitate rapid ignition during burnout operations on a wildland fire or during a prescribed fire operation.

Test Fire: A small fire ignited within the planned burn unit to determine characteristics (such as fire behavior, detection performance, and control measures) on a prescribed fire.

Timelag: Time needed under specified conditions for a fuel particle to lose about 63 percent of the difference between its initial moisture content and its equilibrium moisture content. If conditions remain unchanged, a fuel will reach 95 percent of its equilibrium moisture content after four timelag periods.

Torching: The ignition and flare-up of a tree or small group of trees, usually from bottom to top.

Two-way Radio: Radio equipment with transmitters in mobile units on the same frequency as the base station, permitting conversation in two directions using the same frequency in turn.

Type: The capability of a firefighting resource in comparison to another type – such as Type 1 team, Type 2 crew, Type 1 helicopter, etc. Type 1 usually means greater capability because of power, size, or capacity.

U

Uncontrolled Fire: Any fire which threatens to destroy life, property, or natural resources, and has not yet been declared controlled.

Underburn: A fire that consumes surface fuels but not trees or shrubs. (See Surface Fuels.)

V

Vectors: Directions of fire spread as related to rate of spread calculations (in degrees from upslope).

Volunteer Fire Department (VFD): A fire department of which some or all members are unpaid.

W

Water Tender: A ground vehicle capable of transporting specified quantities of water.

Weather Information and Management System (WIMS): An interactive computer system designed to accommodate the weather information needs of all federal and state natural resource management agencies. Provides timely access to weather forecasts, current and historical weather data, the National Fire Danger Rating System (NFDRS), and the National Interagency Fire Management Integrated Database (NIFMID).

Wet Line: A line of water, or water and chemical retardant, sprayed along the ground, that serves as a temporary control line from which to ignite or stop a low-intensity fire.

Wildland Fire: Any nonstructure fire, other than prescribed fire, that occurs in the wildland.

Wildland Fire Implementation Plan (WFIP): A progressively developed assessment and operational management plan that documents the analysis and selection of strategies and describes the appropriate management response for a wildland fire that's being managed for resource benefits.

Wildland Fire Situation Analysis (WFSA): A decision-making process that evaluates alternative suppression strategies against selected environmental, social, political, and economic criteria. Provides a record of decisions.

Wildland Fire Use: The management of naturally ignited wildland fires to accomplish specific pre-stated resource management objectives in pre-defined geographic areas outlined in Fire Management Plans.

Wildland/urban Interface: The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.

Wind Vectors: Wind directions used to calculate fire behavior.

http://www.firewise.org/

Appendix B

Technical Specifications

Hazardous Fuels Reduction Practices

State of Montana Water Quality Best Management Practices (BMP) and Steamside Management Zone (SMZ) guidelines will be followed when accomplishing all hazardous fuels reduction practices. Consult your Department of Natural Resources & Conservation (DNRC) Service Forester for information regarding these.

Thinning

Thinning is designed to:

1) Create space between tree crowns to reduce the chances of a running crown fire. The recommended amount of separation between tree canopies is determined by steepness of slope. On the average this requires at least 10 feet (flat to gentle slope / 0–20%); 20 feet (moderate slope / 21-40%); or 30 feet (very steep / over 41%)

2) Treat fuels between the ground and crowns of larger trees by removing ladder fuels to reduce the chances of a ground fire from becoming a crown fire.

Non-commercial thinning for Fire Hazard Fuels Reduction is not a standard thinning to enhance the volume of the remaining trees.

It will be the responsibility of the landowner to dispose of this material in accordance with the Downed Woody Fuels Cleanup specifications listed below.

Best management practices will be followed for Hazard Reduction Thinning in Streamside Management Zones. The State of Montana, Department of Natural Resources & Conservation will be involved in decisions regarding thinning within Streamside Management Zones.

Pruning

Tree pruning may be prescribed:

1) For defensible space trees

2) In previously thinned stands

3) In conjunction with thinning

Pruning of all residual trees (trees left after thinning) will be accomplished by pruning 9 - 15 feet above ground level (as specified by Community Forester) or to a height of 1/3 the total height of the tree, whichever is less. This means cutting all branches off the bole of the tree, separating the branch at the bole not leaving any branch stub longer than 3 inches.

Pruning can occur within riparian or upland areas. Best Management Practices will be followed.

Downed Woody Fuels Cleanup

This could apply for 1) removal of slash created by thinning and pruning, 2) fuel hazard thinning already completed but landowner wants to cost share the cleanup of the slash, 3) cleanup of downed woody materials on the forest floor not created by thinning or pruning but is naturally occurring. Cost-share is not tied to how this would be completed but would provide funding toward completion of this work. State of Montana Best Management Practices will be followed.

Downed Woody Fuels Cleanup Specifications All woody debris other than duff and litter will be picked up and either piled by hand or machine for later burning, or chipped in place with chips spread across the forest floor in an even manner, or taken off site to be disposed of . All downed woody debris is defined as any fuels greater than 2 inches in diameter at the large end and longer than 6 feet in length. Up to 50 pieces exceeding this size may be left per acre.

Prescribed burning of slash that is lying on the forest floor (underburning) is acceptable as long as it meets the disposal specifications outlined below for prescribed burning.

Handpiling Specification Handpiles should be designed to properly dispose of all slash. Technical assistance will be available to landowners in handpiling techniques. Piles should be located to protect residual trees from scorch (if burned) or from other damage. All piles must be 100% disposed of by burning, chipping or by hauling slash off site.

Dozer / Excavator Piling Specification Dozer / Excavator piling should be designed to properly dispose of all slash. Technical assistance will be available to landowners in piling techniques. Piles should be located to protect residual trees from scorch (if burned) or from other damage. All piles must be 100% disposed of by burning, chipping or by hauling slash off site. After burning, any pile residue should be spread.

Chipping / Mulching Specification If the landowner chooses this method, all materials greater than 2 inch should be chipped or mulched. Debris may be disposed of by piling in concentrations that imitate decaying logs, spread to no more than 2 inches deep or hauling off site to be disposed of in another manner. This is at the discretion of the landowner.

Flailing and Trampling Specification These methods of slash disposal may be allowed as a means of hazardous fuels reduction at the discretions of the contracting officer. If allowed, all wooden material must be reduced to within 1 foot of the ground.

Handpile / Dozer Pile Burning Specification Burning of handpiles or dozer piles will be done in such a way that will completely consume or dispose of all material contained in each pile. It is the responsibility of the landowner to obtain all proper permits to accomplish this work.

Prescribed Burning (Underburning) Specification Burning of slash and woody debris under standing timber will be done in such a way that will completely dispose (consume) all woody material less than 2 inch in diameter. All woody debris and slash greater than 2 inches in diameter must be disposed of in such a way by underburning to sufficiently reduce the fire risk to a level that will allow wildland firefighters to direct attack a fire within the area during the peak fire season. If the underburning does not accomplish this goal, additional slash treatment must be completed (handpiling or chipping) in order to further reduce the fire hazard. This will be determined by the Community Forester inspection after the prescribed burn.

Appendix C

Fire Risk Rating For Existing and Planned Wildland Residential Interface Developments in Montana, Montana Department of State Lands March 2003.

This document is too large to include in as a full appendix. Contact Montana Department of Natural Resources for a hard copy.

Appendix D

Homeowner Resources: Learning to be Firewise[1]

Throughout the community-outreach component of the planning process, the Steering Committee and GCS Research identified the Firewise program as an ideal set of resources for homeowners interested in protecting their property from potential wildland fire events. As a valuable and readily accessible resource, Firewise provides a plethora of web-based resources and printed materials, which were actively distributed to the various citizens and stakeholders groups who participated in the planning process.

As a long-standing program implemented under the National Fire Plan and reviewed by the National Wildfire Coordinating Group, Firewise information is accurate, accessible, and endorsed by key organizations responsible for community awareness associated with wildland fire risk. These organizations include: The USDA-Forest Service, the Department of Interior, The National Association of State Foresters, the U.S. Fire Administration and the National Fire Protection Association.[2]

During the community meetings previously described, Firewise materials were disseminated to all interested parties and explanations were provided regarding implementation of Firewise protocols. As noted, in many instances, homeowners had already begun a process of identifying priority areas that required fuel treatment prescriptions as well as the creation of defensible space around their individual homes. These communities were encouraged to continue these efforts and share their experiences and knowledge with others in order to show the benefits of proactive, hazard reduction efforts developed at the grassroots level.

Interestingly, in some of the more challenging geographical contexts, multiple ownership matrices were also being addressed through active dialogue between private landowners and state-federal land management agencies looking to collaborate on fuel reduction projects across boundaries. Extending out from the immediate defensible areas in the proximity of the home, these collaborative fuel reduction projects are very important in reducing wildland fire hazards.

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[1] Firewise materials were distributed at public meetings and are available on the internet www.firewise.org.

[2] Please see: http://www.firewise.org/. The Firewise website contains a voluminous amount of readily available information that homeowners can use to learn how to protect their properties from wildland fire hazards.

A recommendation is to consider the implementation of the National Fire Protection Association (NFPA) 1144 home evaluations within the identified priority areas. The 1144 Home Evaluation Form allows fire protection specialists to conduct an evaluation of risk specifically related to the individual structures on particular properties. A number of important risk factors, many of which were already utilized in the existing prioritization process, are assessed in the 1144 process and a general risk rating is determined for the principal dwelling on given property.

GCS Research, in partnership with NFPA, the Firewise Communities Program, and the Swan Valley Unit of the DNRC, implemented such a program in the Swan Valley, MT between 2002-2004. The 1144 form was integrated into a customized software application called LandView™, which allows fire managers in the Swan Valley to view NFPA 1144 tabular data for homes that have received an evaluation.

LandView is built as a distributed .NET Smart application that utilizes Web-based GIS systems (ArcIMS-ArcSDE) for the geographical data and consumes the State of Montana cadastral-CAMA service for parcel and tax-base information. It is fully extensible to any geographical area in Montana and is being considered for implementation across Western Montana by the DNRC.

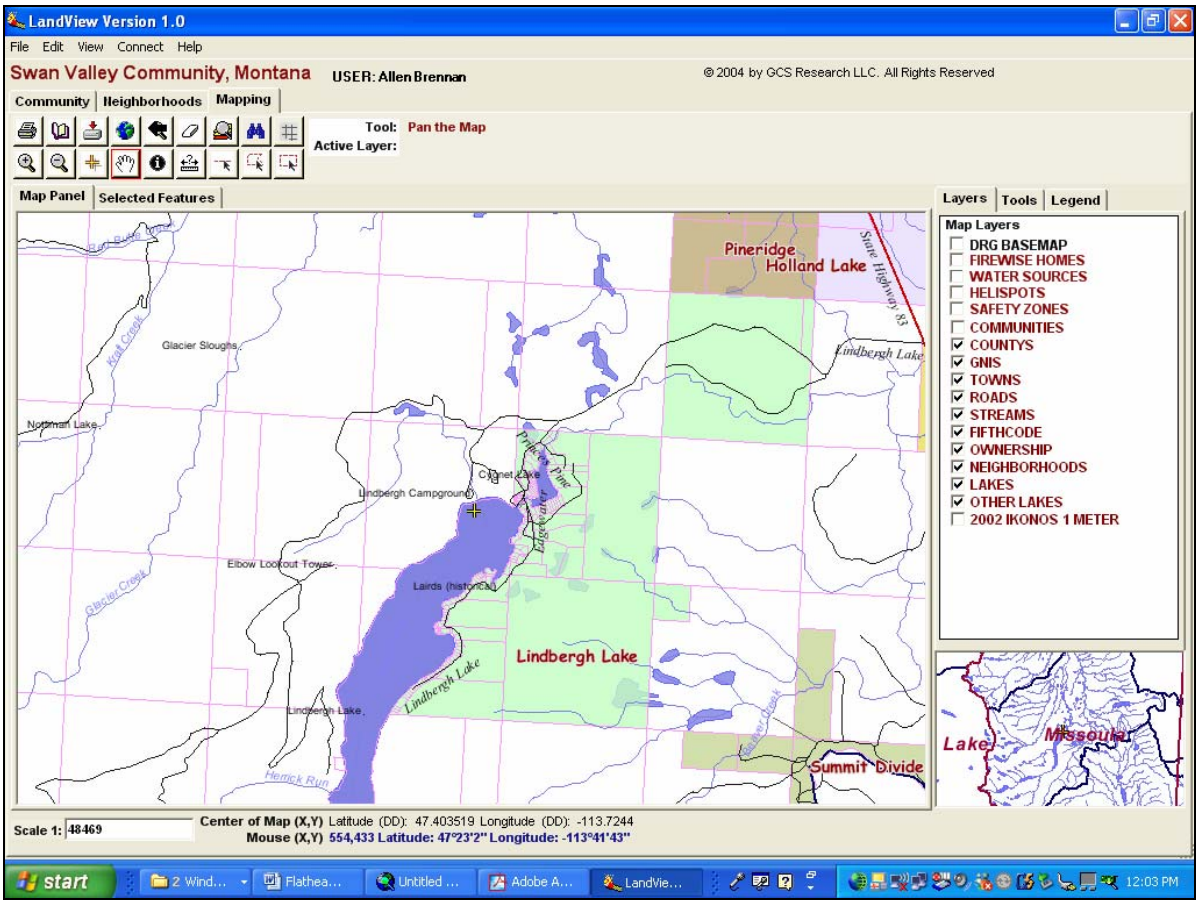

Figure 59: MT Dept. of Natural Resources and Conservation LANDVIEW project. Assisting fire managers and foresters with access to spatial and tabular information for fire hazard mitigation, planning, and response. Funded by NFPA, Firewise Communities, and DNRC. Currently being tested and utilized in Swan Valley, MT. This tool could be used by interested in fire protection officials to monitor and assess priority areas across Flathead Valley.

As home evaluations are conducted for individual properties, the data can be entered using the LandView application and will automatically update a local Access database maintained on the user machine and a SQL Server database maintained by the hosting authority. For the Swan pilot project, GCS Research maintains the ArcIMS-SDE-SQL web service architecture.

However, it is very feasible that the Flathead County GIS Department, which will be the ultimate geospatial repository for the Flathead Fire Plan, could maintain a similar architecture to support the LandView application and the associated digital 1144 forms. All the necessary code, system architecture, and service configuration could be delivered and installed at Flathead County as a component of the Flathead Plan in outgoing years. This system would allow for dynamic, interactive editing and updating of critical homeowners protection information during the implementation phase of the plan.

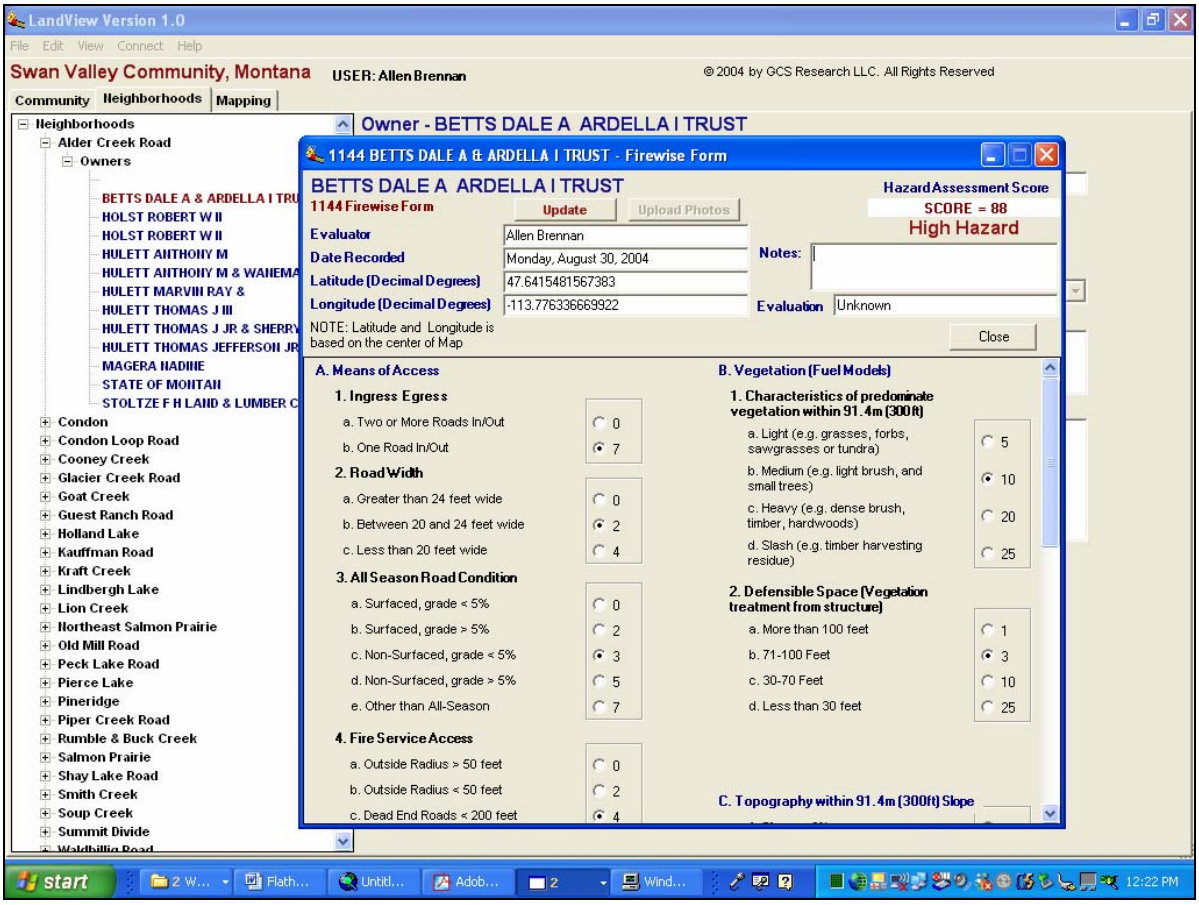

Figure 60: The National Fire Protection Association 1144 Home Evaluation Form exists digitally and is incorporated in the web-based application currently being used by the DNRC. Home evaluation data can be entered online and viewed by clicking on each individual land parcel in the study areas.

Furthermore, it is possible for members of the public to view these Web-based services using the simplicity of a Web browser. Each of the services can be viewed in a Web-browser and information queries can be received using mapping tools built directly in the browser application. This functionality was highlighted previously in discussions regarding the newly implemented Flathead County interactive, Web-based mapping application.[3]

[3] Please see: http://maps.co.flathead.mt.us/flathead/

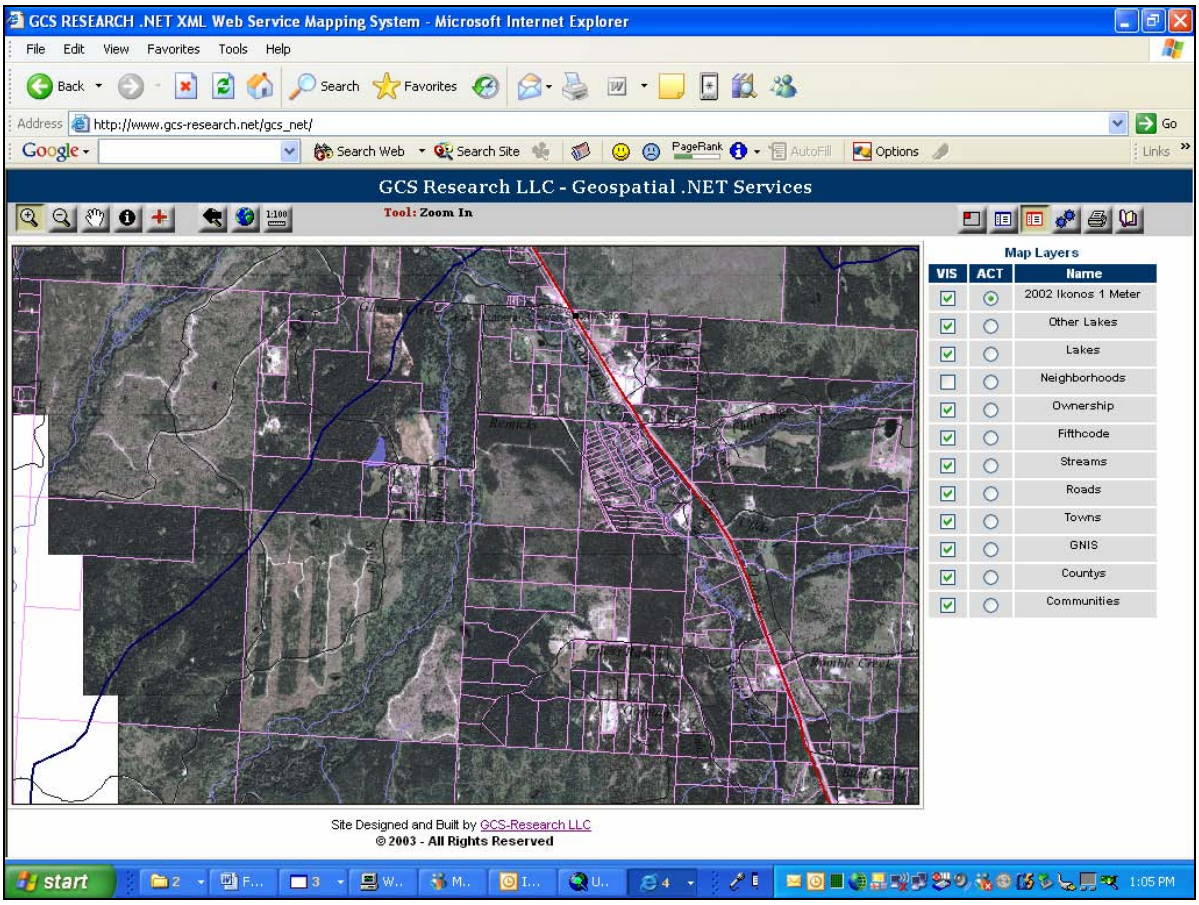

Figure 61: A web-browser application that utilizes the LandView Swan map service. Such a system could be developed for the Flathead Study area and allow people to view priority area information easily and effectively.

Also, the same digital 1144 form that has been included in the LandView application can be utilized in mobile GIS-GPS solutions using GIS software applications such as ArcPad. On previous projects, a Trimble RECON unit has been utilized to extend the ArcPAD application using custom JAVA Applets to support the tabular forms such as the NFPA 1144 form. Field crews can collect GPS coordinates for the particular properties, complete the digital form on the handheld devices, and then upload these data to a laptop or desktop computer for viewing in a GIS or in distributed applications such as LandView.

Figure 62: ArcPAD Application Running Custom Forms such as the NFPA 1144 form. These types of application are currently being used by federal parties to collect fuel data on the ground based upon the USF SFIREMON protocols. The USGS and USFS LANDFIRE Project are also using mobile GIS-GPS applications for vegetation data collection and fuel inventory.

Flathead Steering Committee will continue their efforts in homeowner education, outreach, and monitoring of hazard reduction as a result of fuel mitigation efforts in outgoing years. Changes and improvements before and after assessments of homeowner risk in the identified priority areas can be assessed in the NFPA 1144 forms and a handbook from the Montana Department of State Lands entitled; “Fire Risk Rating for Existing and Planned Wildland Residential Interface Developments in Montana”.

NORTH FORK FLATHEAD

WILDFIRE MITIGATION AND PLANNING REPORT

NORTH FORK FLATHEAD
WILDFIRE MITIGATION AND PLANNING REPORT

1. Geography and Resources.

The North Fork Flathead River flows south from British Columbia into Montana. Officially designated a Wild and Scenic River, it bisects a glacially-sculpted valley that is approximately thirty-five miles long and twelve miles wide. The river is fed by numerous creeks that arise in its flanking mountain ranges.

East of the river lie the Main Range of the Rockies and Glacier National Park, which was carved out of the Flathead Forest Reserve in 1910. The National Park Service is charged with protecting the Park's scenic values and conserving its native plant and animal life. A small number of inholders continue to own property along the river inside Park boundaries.

West of the river lie private and state landholdings, the Glacier View District of the Flathead National Forest and the Whitefish Range. The United States Forest Service manages the Flathead Forest under a multiple-use concept, seeking to balance diverse interests. Among those interests are fish and wildlife habitat, clean water, timber production and recreation. The Forest Service currently is revising its forest plan; proposed strategies in the revised plan include maintenance of areas with high ecological integrity.

The North Fork Valley is one of the most intact ecosystems in North America. All of the wildlife species that inhabited the valley before the arrival of European explorers still live in its reaches. The valley's minimal development and contiguity with Canada afford continuing habitat to grizzlies, wolves, mountain lions, lynx, elk, moose, deer, and many other terrestrial species. Cutthroat, whitefish, greyling and bulltrout swim in still-pristine lakes and streams. Dense forests composed primarily of subalpine fir, Engelmann spruce, lodgepole pine, western larch and Douglas-fir cover the valley's floor and walls. The North Fork's rugged beauty and abundant resources attract many human visitors, some of whom choose to make the valley their home.

2. Demography and Infrastructure.

More than 500 landowners currently hold 1013 parcels of private property on the North Fork. The parcels range in size from less than one acre to 360 acres. Many holdings consist of two or more parcels either acquired at different times or separated by creeks or roads. Roughly 625 of the parcels have mailing addresses. Based on assessment data from the Flathead County GIS Office, the average parcel covers about 14.5 acres and has an approximate taxable market value of $72,300. Taxable market value often is substantially less than actual market value.

About 14,700 North Fork acres are privately owned. Again according to assessment data, private property on the North Fork has an approximate taxable market value of $73,300,000. About $20,000,000 of the aggregate taxable value is attributable to structures.

The Flathead National Forest's Glacier View District consists of about 306,000 acres. The Forest Service effectively presides over the western side of the North Fork Valley, managing most of the area from Big Creek north to the Canadian Border and from the river west to the Whitefish Divide. Forest lands are intermixed with or adjoin private property, particularly in the populated corridor along the river.

The State of Montana manages about 25,600 acres in the North Fork Valley, the majority of which are located in the Coal Creek State Forest south of Polebridge. The remainder of the state-owned acreage lies in scattered school trust lands. State lands also are intermixed with or adjoin private property.

The predominantly dirt/gravel North Fork Road affords the only year-round vehicular access to the North Fork Valley. The road is maintained by Flathead County. Camas Creek Road traverses the southwest corner of Glacier National Park, connecting West Glacier with the North Fork Road at the Camas Creek Bridge. The road is closed during the extended winter months. Trail Creek and Red Meadow Roads, which ascend their respective drainages to the Whitefish Divide, likewise are closed during the winter. The dirt/gravel roads are maintained by the Forest Service. The Canadian border crossing at the north end of the valley currently is closed year-round.

No public utilities serve North Fork landowners, who supply their own water, septic, energy, heating and lighting needs. Hard-wire telephone access is available in Polebridge and in some West-side Park locations. Otherwise, North Forkers rely on radio-phones, satellites, vehicles and twice-weekly mail service for communication.

The North Fork Valley does not have a designated fire district. Instead, the valley is part of a county-wide fire service area providing mutual aid. There are two "stations" on the North Fork, both of which are staffed by community volunteers. The number of volunteers depends upon the season. The Trail Creek Irregulars, consisting of ten to twelve members, staff the Trail Creek station. They have the capacity to develop three fill sites. The Polebridge station is staffed by six to ten members. A 1956 Howe fire truck is kept in the Polebridge area.

County, state and federal agencies also may mobilize in a wildfire emergency in the North Fork Valley. The location of a fire and any applicable agreements determine which agency has the obligation to respond.

Flathead County's National Incident Management System (NIMS) Community Protection Plan calls for a trained team to respond to fire on private property anywhere in the county within a short period of time. Although initial attack is the primary focus of the response teams, they also may carry out sustained attack under a Unified Command system.

The Forest Service has extensive firefighting resources that may be deployed on the Flathead National Forest and state lands. The Montana Department of Natural Resources and Conservation has assigned its firefighting responsibilities on the North Fork to the Forest Service. Glacier National Park and the Forest Service recently entered into a joint fire plan; despite separate mandates, both agencies recognize the need for a collaborative approach to fire management in the area.

In addition, a number of landowners have their own pumps, tanks, hose and other firefighting equipment to protect their properties. The North Fork does not have an Insurance Services Organization (ISO) rating; many landowners have difficulty obtaining property insurance.

3. Fire History.i

The North Fork has been visited frequently by wildfire. Fire has been second only to glaciation in shaping the valley's landscape.

Before permanent settlement of the North Fork Valley, the Kootenai Indians employed several trails to travel from the Tobacco Valley to the eastern slope of the Rockies. They used fire to clear the trails and to improve hunting and gathering along the way. In some documented cases, they also used fire as a battle tactic.

Although anthropogenic ignitions have played a role in the North Fork's fire history, lightning has been the primary source of large fires in the valley. An average of one to two lightning strikes occurs per square mile during the fire season, with a higher number of strikes occurring on ridges and slopes and a lesser number on the valley bottoms. The vast majority of the strikes do not ignite fires. In non-drought conditions, those fires that are ignited rarely become larger than one acre before self-extinction or suppression by firefighters.

About once every thirty years, however, climatic oscillations have created multi-year drought conditions. Then lightning strikes in suitable locations aligned with favorable weather and topography can produce large fires. Because of the dynamic nature of climatic and fuel conditions and the random placement of ignitions on the landscape, it is difficult to derive a single average for how often a particular portion of the North Fork will burn. Thus the so-called "return interval" is best described in a range of years.

In his Fire History of Glacier National Park: North Fork Flathead River (1983), Steven W. Barrett observed that before 1900, fires usually recurred at intervals of fifteen to eighty years. Some stands had fire intervals as short as five years. A few stands had

lengthy intervals, the longest being 169 years. In most centuries, large fires burned across the North Fork for a period of several decades.

Barrett's study of fires in the Park also noted an increase in the frequency of large fires in the mid-nineteenth and early-twentieth centuries. Significant fires occurred in 1844, 1852, 1866, 1889, 1910, 1926 and on the western side of the valley, in 1929. Nearly ninety per cent of Barrett's 60,000-acre study area burned in period from 1887 to 1926.

For approximately sixty years, from the late 1920's to the late 1980's, there were no large fires on the western side of the North Fork Valley. Then in 1988, major fire activity resumed with the Red Bench Fire, which burned approximately 37,000 acres on both sides of the river. The Moose Fire followed in 2001, burning approximately 71,000 acres. 2003 brought the Wedge Canyon and Robert Fires, respectively burning about 54,400 and 52,900 acres. The Wedge Canyon fire destroyed seven homes and twenty-nine outbuildings in the area between Trail Creek and Whale Creek; one home was damaged. The costs of suppressing the Wedge Canyon fire exceeded $50 million.

Notably, all four of the recent fires – Red Bench, Moose, Wedge Canyon and Robert – were ignited in the Whitefish Range. Pushed by prevailing winds, they traveled in an easterly direction across the populated corridor along the North Fork River before spreading into Glacier National Park. The predominant wind direction during the fire season is from the southwest. Winds from the south and the west also are common but less frequent.

The North Fork Valley is a fire-adapted ecosystem. Periodic wildfire influences the valley's vegetation patterns, its habitats and ultimately, the composition of the species living there. The natural frequency of fire and the propensity toward occasional large, stand-replacing fires present a significant challenge to North Fork landowners, however. Almost seventy-five per cent of the land currently held in private ownership in the North Fork falls within a fire perimeter from 1910 to 2003, as depicted in the accompanying fire history map.2

4. Community Response to the Fires of 2003.

The fires of 2003, and recognition that that the current fire cycle probably has not run its course, prompted the North Fork Improvement Association (NFIA) to appoint a Fire Mitigation Committee. The NFIA is a landowner organization that provides a forum for addressing issues that confront the community, including land use planning. About 230 landowners now belong to the Association.

The NFIA's Fire Mitigation Committee reflects the diverse interests and concerns of the North Fork community. The committee meets monthly in an effort to determine what can and should be done to mitigate the risks of wildfire on and adjacent to private lands, particularly the risks to structures. Despite their diversity, committee members' commitment to the North Fork and experiences in recent fire seasons have helped them to achieve consensus on the issues that they have considered.

a. Creating Defensible Space

One of the Fire Mitigation Committee's principal objectives has been to suggest sensible, cost-effective techniques that North Fork landowners may use to create defensible spaces around their homes. Under the auspices of the Northwest Regional Resource Conservation and Development Council (RC&D), the North Fork obtained a Western States grant to assist landowners with hazardous fuel reduction. The committee moved quickly to implement the grant program, serving as a model for other geographic areas in Northwest Montana.

During the first phase of the Western States grant program, RC&D foresters provided free home/wildfire inspections to interested North Fork landowners. Approximately 100 landowners requested inspections, significantly more than had been expected. Each inspection generated a treatment prescription based on Firewise principles, creating a zone of protection around a home. The inspection phase of the program has been a remarkable success, evidence of the North Fork landowners' willingness to assume substantial responsibility for protecting their properties.

Hazard reduction, the second phase of the grant program, began in the fall of 2004. RC&D foresters have prioritized private lands on the North Fork for treatment. Generally, properties that have not burned since the fires of the early twentieth century have the highest priority. Properties that burned in the 1988 Red Bench fire have second priority and those that burned in the 2003 fire season, third priority. Additional criteria for selection include values at risk, fire risk, access, previous fuel treatment, potential joint projects, interest in the program and willingness to meet contract specifications.

Under cost-share agreements with the RC&D, the Western States grant will pay approximately $133,000 and landowners will pay approximately $44,000 toward treatment of their properties. The goal is to treat 439 acres at an average cost of $400 per acre. Some properties will cost more to treat and some less. Additional grants have been sought to help fund future fuel reduction projects by North Fork landowners.

b. Strategic Planning

In keeping with the National Fire Plan, the NFIA's Fire Mitigation Committee has adopted a definition of "Wildland/Urban Interface" that is tailored to the North Fork ecosystem's geography, demography and fire history.

The North Fork community occupies a corridor at risk from severe wildfire. The corridor is approximately three miles wide and thirty-five miles long, extending from Big Creek to the Canadian Border along the North Fork of the Flathead River. The community's wildland/urban interface extends up to 1.5 miles from the boundaries of the corridor, where private property adjoins or intermixes with public lands.

Committee members also have participated in the development of the Flathead County Wildfire Protection Plan. They have identified properties in inhabited areas of the North Fork that they consider to be most at risk from future wildfires. Those properties, which are shown in the attached map depicting priority fuel reduction areas,3 are as follows:

Properties on the "North End," from Trail Creek to the Canadian Border, are considered particularly at risk. The area has not burned since the fires of the early twentieth century. Many sites within the area are choked with mature and decadent lodgepole pine and heavy downed fuel. The sites are difficult to access and to defend.

Properties in the area from Whale Creek south to Moose Creek, which also have not burned during the renewed fire cycle. Thick ladder fuel are intermingled with older trees on many sites. Center Mountain Road, now gated, anchors the western side of the area.

Properties in the river corridor from Hawk Creek south to the 1988 Red Bench Fire boundary. In addition, properties within the fire boundary with significant downfall and dense lodgepole regeneration stands also may be at risk now or in the near future. Properties in the Hay Creek area, both north and south from the top of Hay Creek Hill, which have not burned during the current cycle.

c. Collaboration with Government Agencies

In connection with its strategic planning process, the Fire Mitigation Committee has welcomed partnerships with the Forest Service, Glacier National Park and the Montana DNRC. Recent legislation has encouraged collaboration to reduce the likelihood of high-intensity fire in interface areas adjoining private property. The committee and its partners seek to be proactive rather than simply reacting to fires once they have begun.

The Forest Service has been particularly receptive to conducting focused fuel reduction projects on hazardous Flathead National Forest sites. The agency has projected a sequence whereby North Fork landowners proceed with fuel reduction around their homes followed by Forest Service reduction on interfacing public lands. The underlying premise is that public and private efforts must complement one another, with homes being the focal point. Mitigation efforts radiate from those places where fire is least wanted.

Stevens grants may be available to assist private landowners when a responsible agency has begun planning for fuel reduction on public lands adjacent to their properties. The RC&D has applied for a Stevens grant on behalf of North Fork landowners, accompanied by a letter from Glacier View District Ranger Jimmy DeHerrera advising that the Forest Service is engaged in fuel reduction planning for the North Fork.

d. Community Consultation and Education

Landowner consultation and education are critical components of the planning process. The Fire Mitigation Committee has solicited input from members of the North Fork community at numerous meetings. It also has sponsored several well-attended workshops and provided written materials so landowners can make well-informed decisions about mitigating risk on their properties. Although fuel reduction is voluntary, owning property in the fire-prone North Fork Valley confers both privilege and responsibility.

Whatever individual landowners may decide to do on their properties, community understanding of the role of fire in the North Fork ecosystem has been enhanced since the 2003 fire season. So has community understanding of what can be done to reduce the hazards of severe wildfire that threatens lives, homes and access to the valley. With the collaboration of public agencies, the community is moving forward to implement those understandings on the ground.

5. Conclusion

The Flathead Community Wildfire Protection Plan establishes county-wide priorities for funding fuel mitigation projects. In areas where large fires occur, the criteria for determining priorities appropriately include life safety issues associated with population density; the presence of fuel hazards; fire history; threats to infrastructure; and environmental considerations.

The North Fork has a relatively low population density and therefore limited infrastructure. Nonetheless, a compelling case can be made for assigning a high priority to North Fork fuel mitigation efforts. The fire cycle has resumed. Given the North Fork's fire history, it is reasonable to project that at least some of the areas that have not burned since 1988 will burn before the cycle ends. High fuel loads in many unburned sites increase the probability of large fires.

The need for proactive fuel mitigation to help protect firefighter and public safety is commensurate with the probability of large fires in the future. So is the need for proactive mitigation to help protect structures. The North Fork's relative remoteness and limited escape routes make it dangerous, difficult and expensive to wait until fires are burning to attempt to abate known hazards. Public policy would be well-served by encouraging responsible mitigation measures, particularly in light of the human and financial costs of suppressing the Wedge Canyon fire.

Finally, the North Fork community has recognized its vulnerability and has taken action to reduce the risks that wildfire poses to safety, structures, ingress and egress. The community's willingness to address risk is an appropriate consideration in determining priorities for funding future fuel reduction projects.

North Fork Improvement Association
Fire Mitigation Committee
December, 2004

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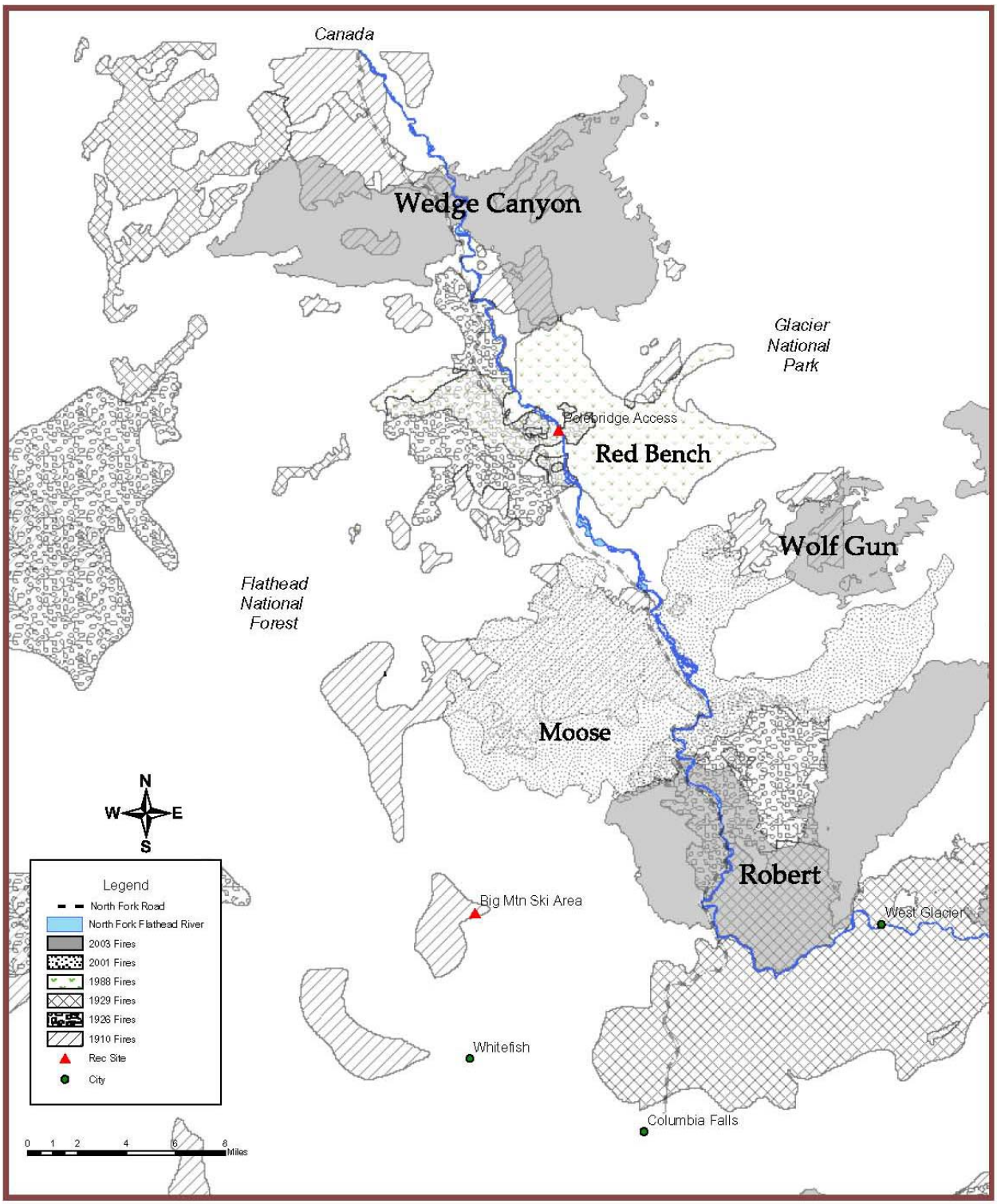
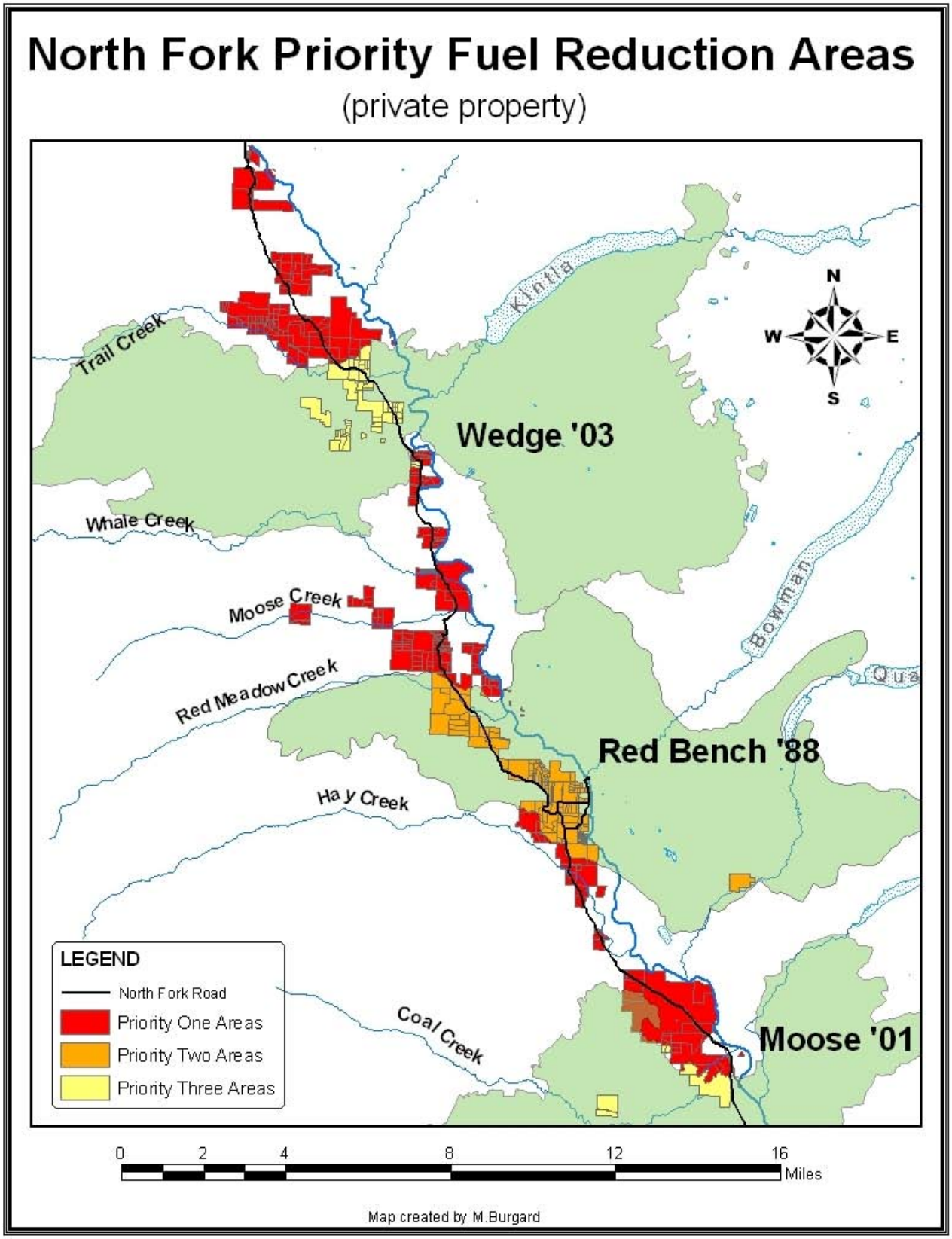
1. Mitchell R. Burgard, Prescribed Fire Specialist and Assistant Fire Management Officer for Glacier National Park, collaborated in preparing the fire history section of the report.

2. The accompanying fire history map was prepared by Forest Service personnel and is used with the agency's permission.

3. The accompanying priority fuel reduction map was prepared by Mitchell R. Burgard and is used with his permission.

Fire History
North Fork Flathead




North Fork Priority Fuel Reduction Areas
(private property)
Trail Creek
Whale Creek
Moose Creek
Red Meadow Creek
Hay Creek
Coal Creek
Wedge '03
Red Bench '88
Moose '01
N
W
E
S
LEGEND
North Fork Road
Priority One Areas
Priority Two Areas
Priority Three Areas
0 2 4 8 12 16
Miles
Map created by M.Burgard